JULY, 1956

TOOLING and PRODUCTION

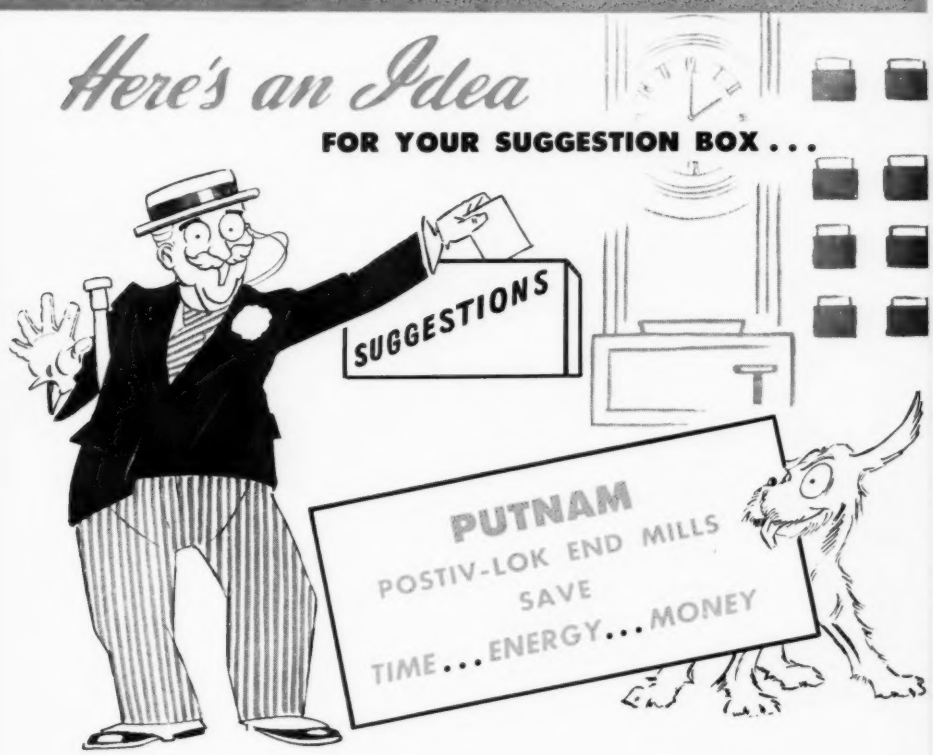
The Magazine of Manufacturing Management

FEATURED, THIS ISSUE:

Executive Development . . . p. 7 ♦ Prototype Tooling . . . p. 58
Distribution of Air . . p. 63 ♦ Precise Linear Positioning . . p. 69
Complete Editorial Index . . . p. 56
New Products . . . p. 120 Shop Aids . . . p. 134 Helpful Literature . . . p. 136

Here's an Idea

FOR YOUR SUGGESTION BOX . . .



Postiv-Lok tooling reduces costs as much as 25% or more by eliminating the integral taper shank from large end mills and putting it on a holder. The Postiv-Lok holder soon more than pays for itself through cost savings on end mills. The Postiv-Lok design also assures reduced set-up and change-over time on a machine when production requires switching from one end mill to another.

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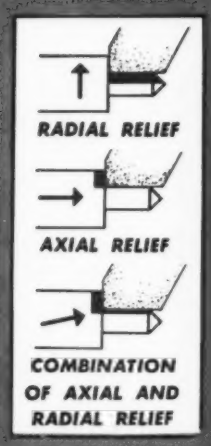
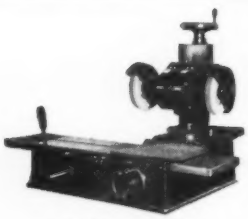


The Biggest Improvement in Years in Cutting Tools has been in the Method of Sharpening Them

INTERNAL ATTACHMENT

MOTORIZED MODEL



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Form ground relief is stepping up cutter life by as much as 200% and replacing old style angular cutting edge relief on thousands of jobs in metalworking plants across the country. Why is it better?

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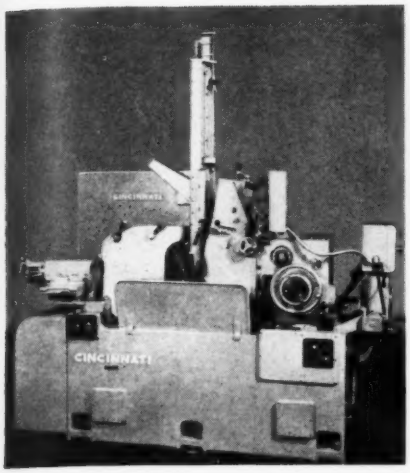
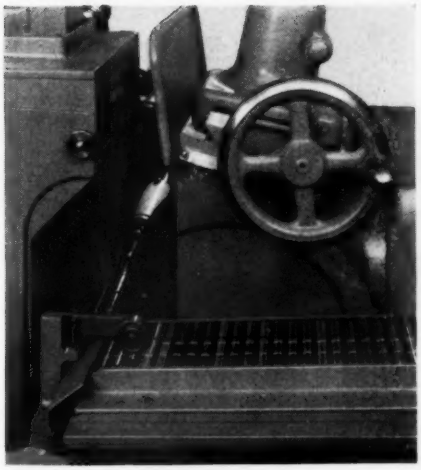


Universal joint spiders. An ingenious loading device transfers the parts from one pair of wheels to the next. Four diameters are automatically ground each cycle. CINCINNATI® FILMATIC No. 2 Centerless Grinder.



Pump shafts. A magazine type work loading fixture and automatic infeed attachment help to reduce the cost of grinding bearing grooves. CINCINNATI FILMATIC No. 2 Centerless Grinder.

...and Cincinnati Centerless Automation *can reduce costs in your shop, too*

Centerless grinding is a "natural" for automation. It can be developed to any degree required for your production, from a simple feed cycle to a complete line. Cincinnati Centerless grinding specialists have been doing this type of work for 33 years. That's one reason why it will pay you to consider Cincinnati first. Only Cincinnati can give you the advantage of long experience and a choice of *six sizes of centerless grinders.* May we hear from you?

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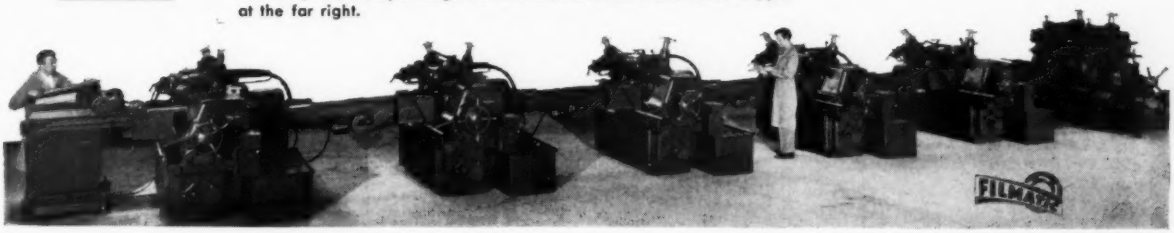
Rocker arm shafts are loaded into the hopper at the left and transferred by conveyor from one CINCINNATI FILMATIC No. 2 Centerless to the next, and finally through the CINCINNATI FILMATIC Centerless Lapper at the far right.



Automotive valves. Parts are received from an overhead conveyor and automatically ground at the rate of 22 per minute. CINCINNATI FILMATIC No. 2 Centerless Grinder.

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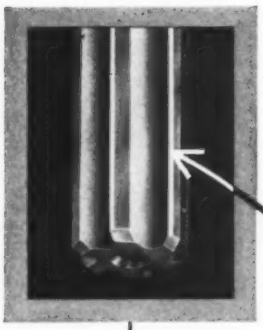

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JULY, 1956

George J. Huebner, Founder

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TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

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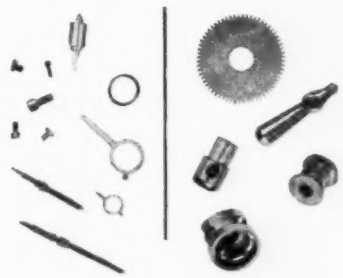

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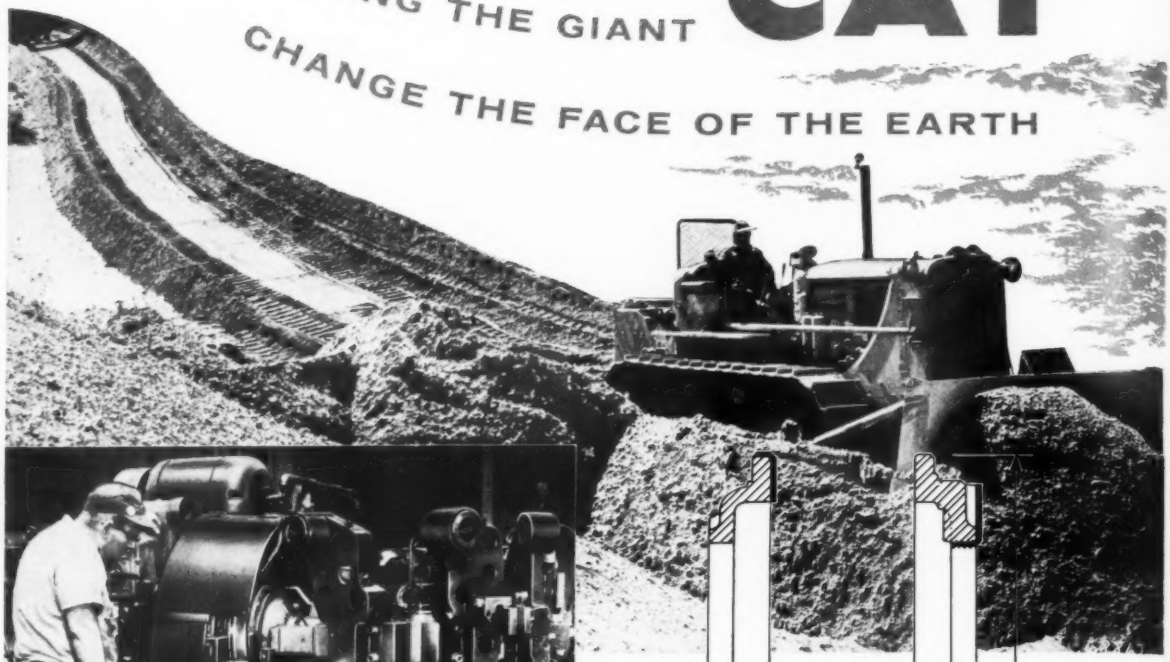

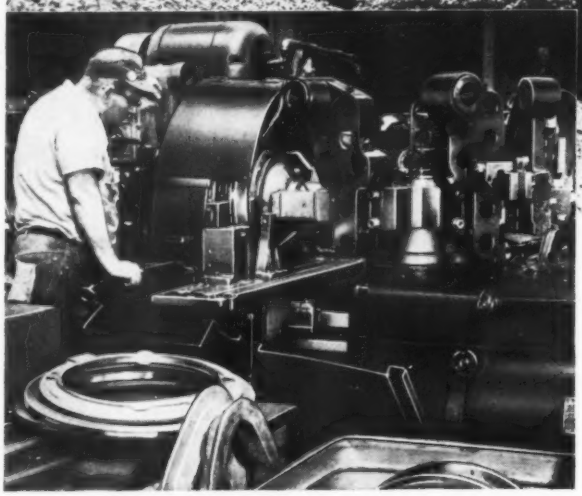

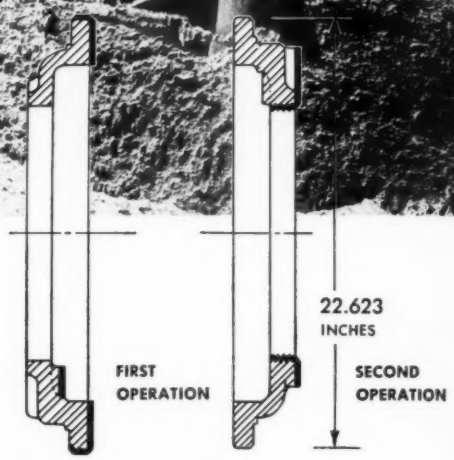

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

THE EMERGENCE OF THE PROFESSIONAL EXECUTIVE

by Donald H. Sunderlin
SUNDERLIN ORGANIZATION
Consulting Management Engineers
Cleveland, Ohio

DURING THE LAST TWO DECADES a changed concept of administration has resulted in greatly increased corporate productivity. This has come about through the development of more effective directing techniques and a new corps of executives trained in the philosophy and mechanics of democratic leadership.

What is this philosophy, why is its implementation so much more effective, how do the new techniques differ from the old ones, and what manner of man is the professional executive? That is the area we are attempting to illumine and these are the questions we seek to answer.

Ohio State's Professor R. C. Davis in his book, "The Fundamentals of Top Management," states, "A free competitive system implies the right to found a business enterprise, provided one has the courage and the capital. Part of the price of a system of free enterprise is the continuous entry of business mechanics into business. Their management methods at best are mediocre. This has been offset, however, by the development of a class of professional executives who have been trained in the use of modern management methods."

The widely held interest in the principles of executive leadership is due, in part, to recognition of the importance of leadership in any organized activity. It may also be due to the almost universal desire for any easy formula leading to power, prestige, and riches. There is such a formula but it is complex and difficult to apply; complex because of its many interrelated factors, and difficult to apply because some who would be executives are not endowed by the necessary personal qualities including the willingness to work

. . . Continued on Page 10

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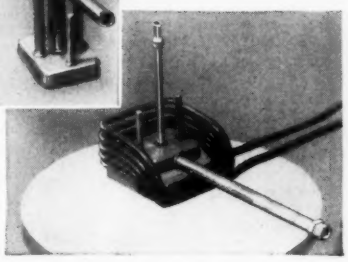

The simultaneous soldering of a group of components within one load coil is an ideal application for induction heating. The assemblies consist of mounting studs and tubes inserted into a machined part together with preformed solder rings. The heating is done so rapidly that there is practically no scaling or discoloration.

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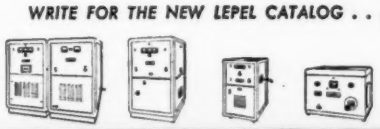

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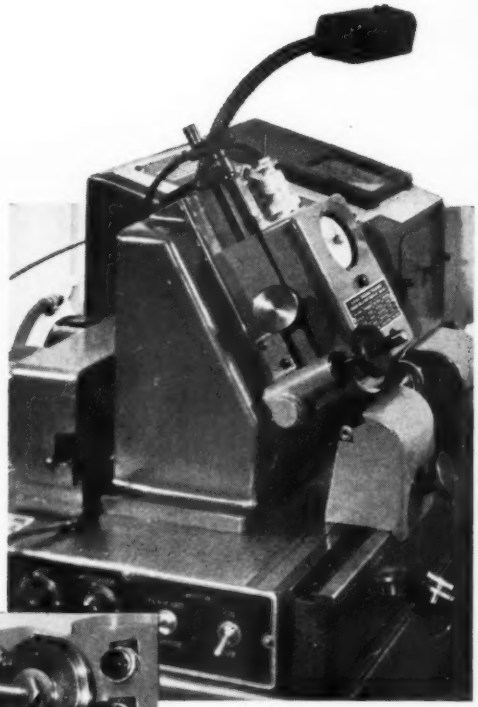
2. Extra precision: Fellows No. 4 Fine-Pitch Gear Shaving Machine makes good gears better with finer finish, minimum backlash, tighter tolerances where desired.



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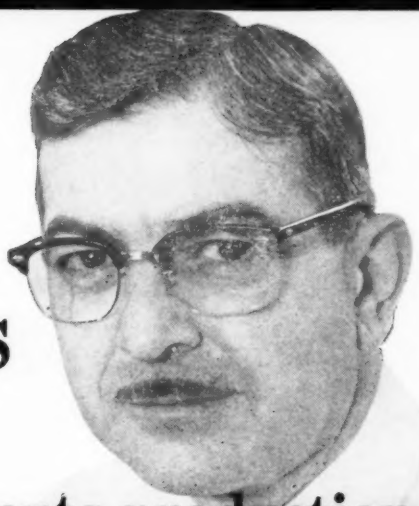

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Fellows Precision Line also includes other types of gear inspection instruments and a number of models of Gear Shapers for cutting spur and helical gears of larger sizes. Your Fellows representative can give you information about any of them. And, ask him about the Fellows Plan for deferred payment too. Write, wire or phone any of our offices.

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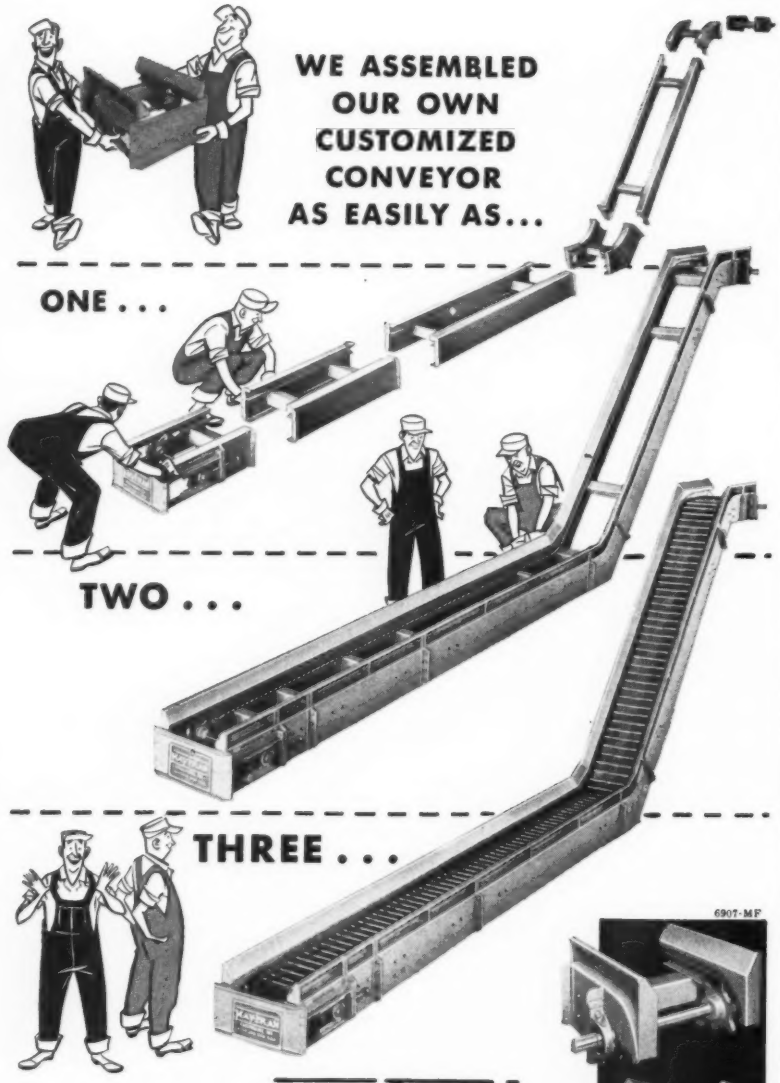
TWO . . .

THREE . . .



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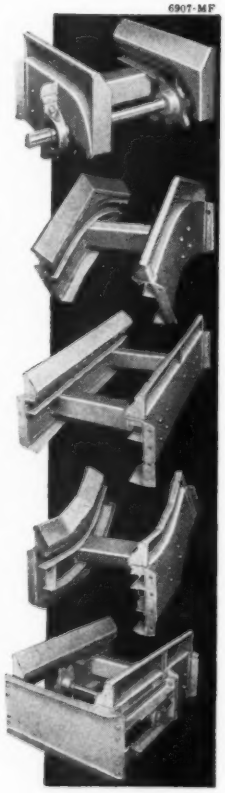

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1726 Clarkstone Road • Cleveland 12, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 10

. . . Talk of Month, from Page 7

hard at self improvement and to exercise restraint when power is in their hands.

Every executive regardless of the management level on which he works, or whether the nature of his work is line or staff, achieves his objective through the efforts of others. If there were no one under his jurisdiction, he would not properly be called an executive irrespective of the importance of his work. As the number of those we direct increases, our personal productivity expands; in effect we are given longer days — for each of us, by himself has but the universal, daily allotment of 24 hours.

Our leadership or administrative practices have evolved with the broadening of our ethical and psychological horizons. What were they and how effective were they yesterday? What have been found to be sounder practices? And why are the corporate objectives, set forth in the charter, now so much more certain of attainment?

The military provides a classic example of the evolution, and an examination of the record will reveal the contrast between democratic leadership and autocratic discipline in the armed forces of two nations. Students of military art have attributed the Allied victory in World War I, in no small measure, to the superiority of the American concept of leadership over that held by the Kaiser's high command.

In those days of static warfare, our lieutenants leaped out of the trenches first and led their men instead of following them. Before an objective was to be taken, the non-coms were briefed on what was to be done, the part each platoon was to play, and the relationship of that particular skirmish to the overall effort of the sector.

If the leader was lost through enemy fire, the command passed to the next lower officer and there was no cessation of purpose; resourceful men exercised their initiative because they had been informed of the objective and the role each was to play. By contrast, the German soldier fought equally well but only so long as his commander was able to direct him. Without his superior he became perplexed. Today, the newly organized forces of West Germany follow the American precept.

Another difference between the armed forces of the two nations in those days was that the American officer served his men and the German officer was served by his men. This concept of support to, instead of from, the doughboy has stood the test of time; in World War II General Eisenhower confided to a frightened youngster marching to the attack that he too was scared. General Ridgway knelt to tie a para-

. . . Continued on Page 12

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Assures You Precision to the Finest Degree to Meet Your Requirements —Backed by the Name Supreme in the World of Measurement.

GAGE BLOCKS

(JOHANSSON) and accessories.
Short deliveries. Inspection and reconditioning service available at our plant.

INTERNAL INDICATORS

(for inside measurements .155 to 24 inches) Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

MIKROKATOR

(Amplifier—for outside measurements) Graduations .0001 to .000002 or .001 M to .0002 M.

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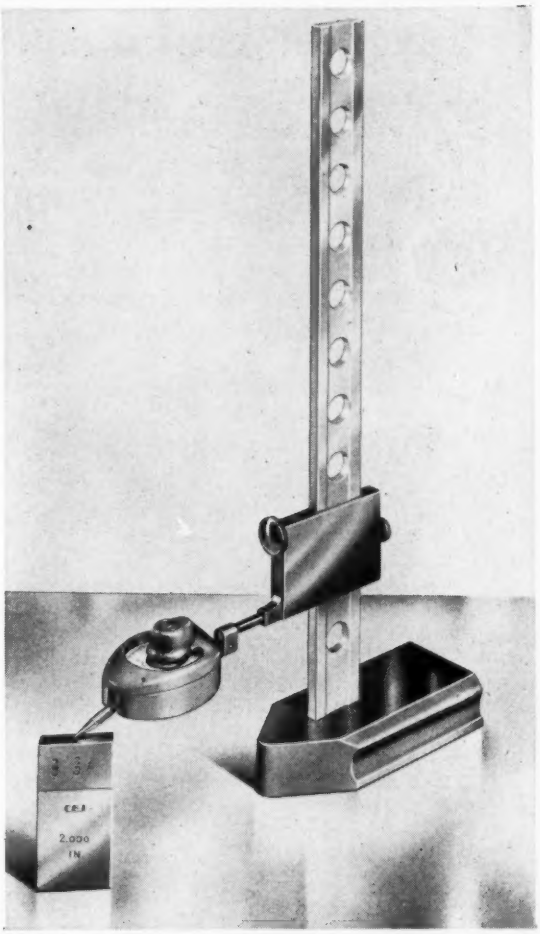

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WITH HEIGHT GAGE

The Minikator No. 590 is a micro-indicator especially designed for transferring dimensions and measuring in otherwise inaccessible places. The instrument is particularly suitable for indicating out-of-roundness or concentricity of grinding machine spindles and for locating drilling jigs.

The amplification device of the Minikator is based on the Mikrokator Principle, it is purely mechanical and without friction and slackness. Measuring points of two different lengths 1/16" diameter are supplied with every instrument. One point provides a measurement range of .003" (0.08 mm) with .00005" (0.001 mm) dial graduations and the other provides a range of .006" (0.16 mm) with .0001" (0.002 mm) dial graduations.

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CIRCLE INFORM-A-GRAM KEY NO. 11

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PEM Self-Clinching Template Drill Bushings offer revolutionary features that permit you to do just that.

1. Permit thin gauge template metals, aluminum or cold rolled steel—one-third the thickness required for conventionally bushed holes.
2. One-hole mounting—in the hole to be bushed. No processing of additional mounting holes. No riveting, or welding. Simply drop PEM bushing in hole and squeeze into place.
3. Compression Mounted—one or several at a time—and positively locked into position by self-clinching action of bushing shank design.
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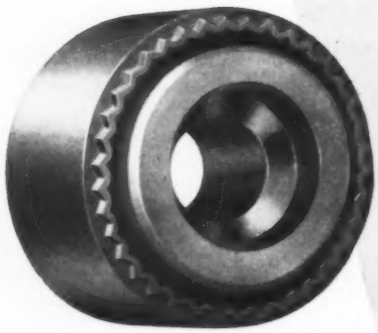
5. High torque and pull out resistance are provided by back tapered shank and corrugated clinching ring.



PEM Bushings are round, one-piece hardened steel units—not assemblies. Require no indexing or nesting of irregular shapes. Provide location in closest proximity when required.

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Write for literature and samples for trial.

PENN ENGINEERING & MANUFACTURING CORP.
DOYLESTOWN, PENNSYLVANIA

PEM

CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Talk of Month, from Page 10

trooper's boot during the Korea campaign.

In the Roman Catholic Church the supreme head refers to himself as "the servant of the servants of God". So it goes. The great leaders put their talents at the disposal of their followers; they see their role as one of giving rather than receiving.

The examples taken from the military and the church illustrate the changes in business administrative practices which have taken place, especially during the post-war period. Gratifyingly, the modern view is not only more compatible with our higher ethical values but it is far, far, more productive than the former "bull of the woods" bossing.

Technical Specialization Is Not A Requirement on the Upper Levels

Top leadership is something requiring expertness in a specialized area of its own. A president or general manager need not be a better specialist in each function than those he directs; in fact, the really wise upper executive surrounds himself with specialists who may be superior to himself in their own areas. However, he must possess the knack of welding these men into a cohesive force and that is a specialty in itself.

DuPont's president, Crawford H. Greenwalt, has this to say on the subject, "The basic requirement of executive capacity is the ability to create a harmonious whole out of what the academic world calls dissimilar disciplines. This is a fancy way of saying that an executive is good when he can make a smoothly functioning team out of people with the many different skills required in the operation of a modern business. His most important function is to reconcile, to coordinate, to compromise, and to appraise the various viewpoints and talents under his direction to the end that each individual contributes his full measure to the business at hand."

Yesterday's unenlightened manager believed that he should be able to "show up" a subordinate on occasion, which was not difficult when he had staffed his team with inferior subordinates. His "one man show" philosophy was discouraging to those who could do some things better than he could and, as a result, he found himself doing the tough jobs for his subordinates. That made him important, it forced others to be dependent on him, and it gave him occupational ulcers. More seriously, it failed to develop his subordinates so their contributions could then be greater or so they could assume heavier responsibilities in the future.

That kind of leadership is outmoded today. Through the loss of enterprising executives and the re-

. . . Continued on Page 17

Only WESPO® can furnish ALL of the following WORK-HOLDING DEVICES

● TOGGLE CLAMPS and PLIERS

37 TYPES and SIZES

WESPO Toggle Clamps are made in types and sizes to meet all work-holding needs, light, medium and heavy duty. Features include: REAMED HOLES, for better bearing—HARDENED BUSHINGS—SERRATED to prevent turning—HIGH TENSILE STRENGTH RIVETS for longer service.

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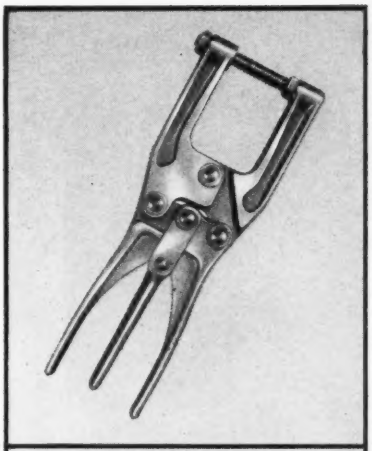

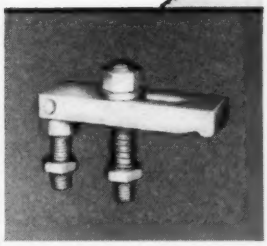

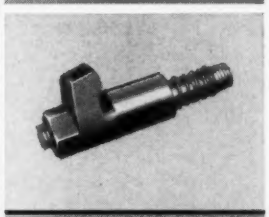

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WESPO fixture clamp assemblies save up to 70 percent on your own designing and machining. They are being used as standard by a large number of leading manufacturers.

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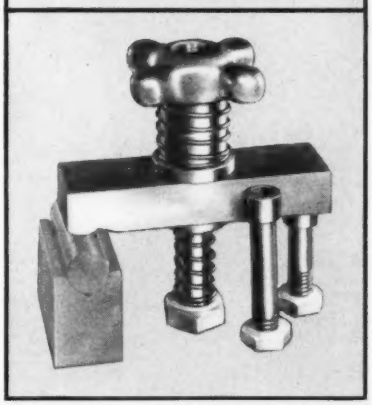

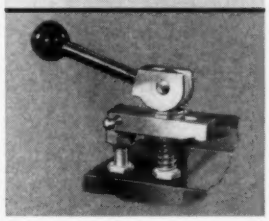

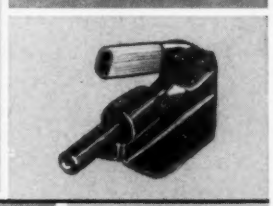

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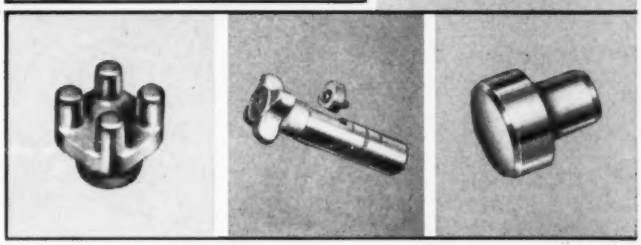

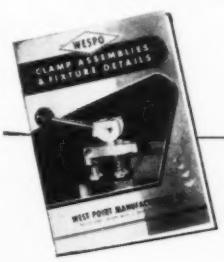

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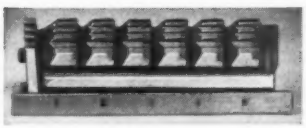
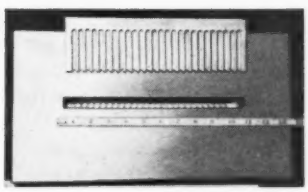
grinding this single point tungsten carbide tip boring tool.



WE SAVED 16 HOURS

plus 9 different operations on this form grinding of a carbide broach.



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on the machining of this die casting die.

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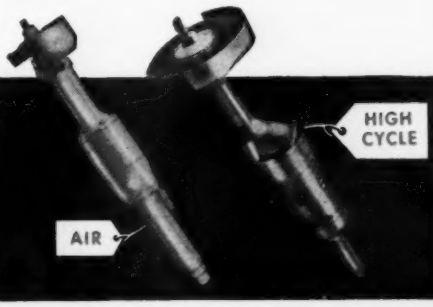
New J-2L Impact Wrench is reversible . . . specially designed for minimum maintenance.

Find out how *you* can cut costs with the rugged, lightweight J-2L and other new Rotor Tools! Ask for Bulletin 41.



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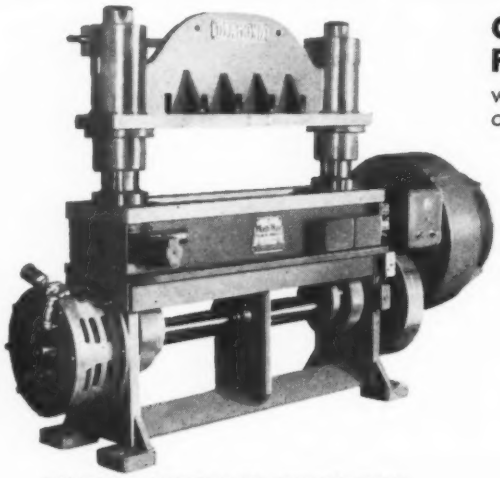

DIAMOND MULTI-MAX PUNCH PRESS
MODEL 5036 ILLUSTRATED

OPEN THROAT PRESSES . . .

with long bed and ram areas illustrated in a new catalog, "Profit From Presses". Twenty pages with case history photographs such as illustrated below. Diamond Multi-Max punch presses are available in 30 and 50 tons capacity, 100 tons on special order. Six models for your selection. 24", 36", 48", 60", 72" and 84" working surfaces of bed and ram lengths. Air clutch and air brake at no extra cost. Mail in above coupon for your copy of this catalog, or writeon your letterhead.

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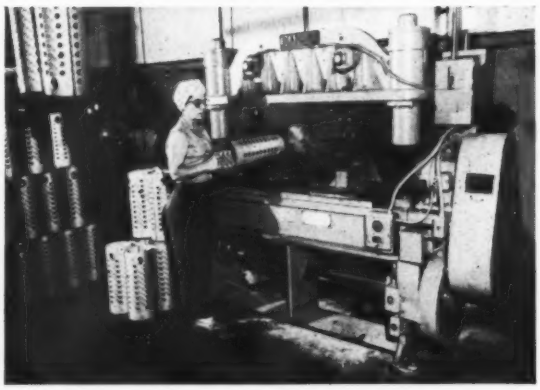
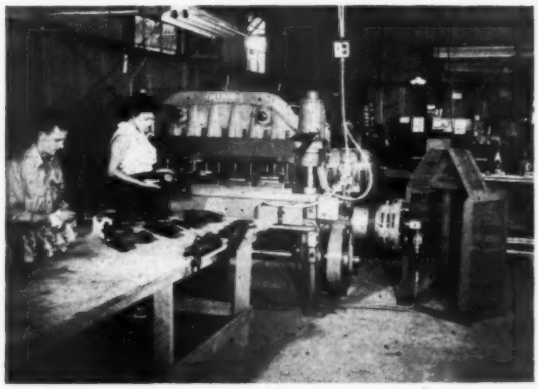


SOLAR AIRCRAFT COMPANY, SAN DIEGO, one of three Multi-Max presses used by Solar Aircraft Company in perforating parts of combustion chambers for jet engines. Large bed area required for two stage dies. Large shut die height required for insertion and removal of bulky combustion chambers.



SAURENMAN COMPANY, INC., EL MONTE, assembling and riveting Saxton Kant-Twist clamps on a Multi-Max press. Large press bed area is required for the permanent installation of nine dies for riveting nine different size clamps from one inch opening to twelve inch opening. Advantage of this permanent multiple die set up is in riveting various size clamps.

DIAMOND MACHINE TOOL CO.

DIAMOND MACHINE TOOL CO.
PICO, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Talk of Month, from Page 12

tention of complacent ones, legitimate profit possibilities are missed. Then, as the hand of the guiding figure loses its touch, the deepening red of the figures leads, inevitably, to liquidation or re-organization.

In contrast, the professional executive recognizes that his major job is the coordination of the efforts of the individual members of his team, some of whom are potentially able to take over his job. His usefulness is measured, not by his indispensability, but rather by the capacity of his subordinates which is reflected in the quality of their performance.

As we go down the scale of executive responsibility and the subordinate must have greater specialized skill, his boss too must have more on-the-job experience to be of real help to him. But regardless of the responsibility level, the ability to direct is always more necessary than the ability, personally, to excel on a subordinate's job.

A good analogy to an executive's job is that of the symphony conductor whose baton unifies the efforts of the different musicians to produce a glorious and harmonious sound effect.

No conductor is master of every orchestral instrument and no executive is highly skilled in every function under his direction. Today, skill in any of the specific operating fields becomes less and less significant as one climbs through the successive levels of responsibility.

Administrative Functions

The professional executive instinctively operates in terms of specific elements: Planning, Organizing, Directing, Coordinating, and Controlling. The foregoing terms have been used in management circles for a long time. Exactly what do they mean and how do they apply to the subject of administration?

Planning

The function of planning ranges all the way from defining the overall company objectives to the planning of long and short term projects. It includes the formulation of those policies which lead to specific decisions in the operating area without necessity of constant review or clearance with superiors. Planning is essentially the "how" of attaining any objective. "How" involves what is to be done, who will do it, where it will take place, when it will be undertaken, and why the contemplated plan of action is the most logical of the several possible ones.

Nowadays, it is customary to plan and schedule the production operations in small increments of time; yet, some executives who are paid many times more than a machine operator, spend so many hours in conferences that too little time remains for them to do their work.

. . . *Continued on Page 18*

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Quality Control

INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Talk of Month, from Page 17

Or their highest skills lie dormant and untapped while they are doing routine things which should have been delegated — all because intelligent planning is lacking. It is not how **much** they do but how **well** they do what they **should** be doing that makes the professional executive more productive.

Organizing

Organizing is a matter of utmost paramountcy since it has within itself the seeds of success. In a strong organization structure are found provisions for sound policies, capable personnel, effective procedures and forceful management controls — the basic prerequisites of successful administration.

An old fashioned president, who placed no value on organization charts, found two of his vice-presidents in conflict because one of them, not knowing the limits of his job, had assumed responsibilities which should have been assigned to the other. These men, by blocking each other on every occasion, cancelled out one another instead of multiplying the team effort. Men working together are equal to more than the sum of their numbers.

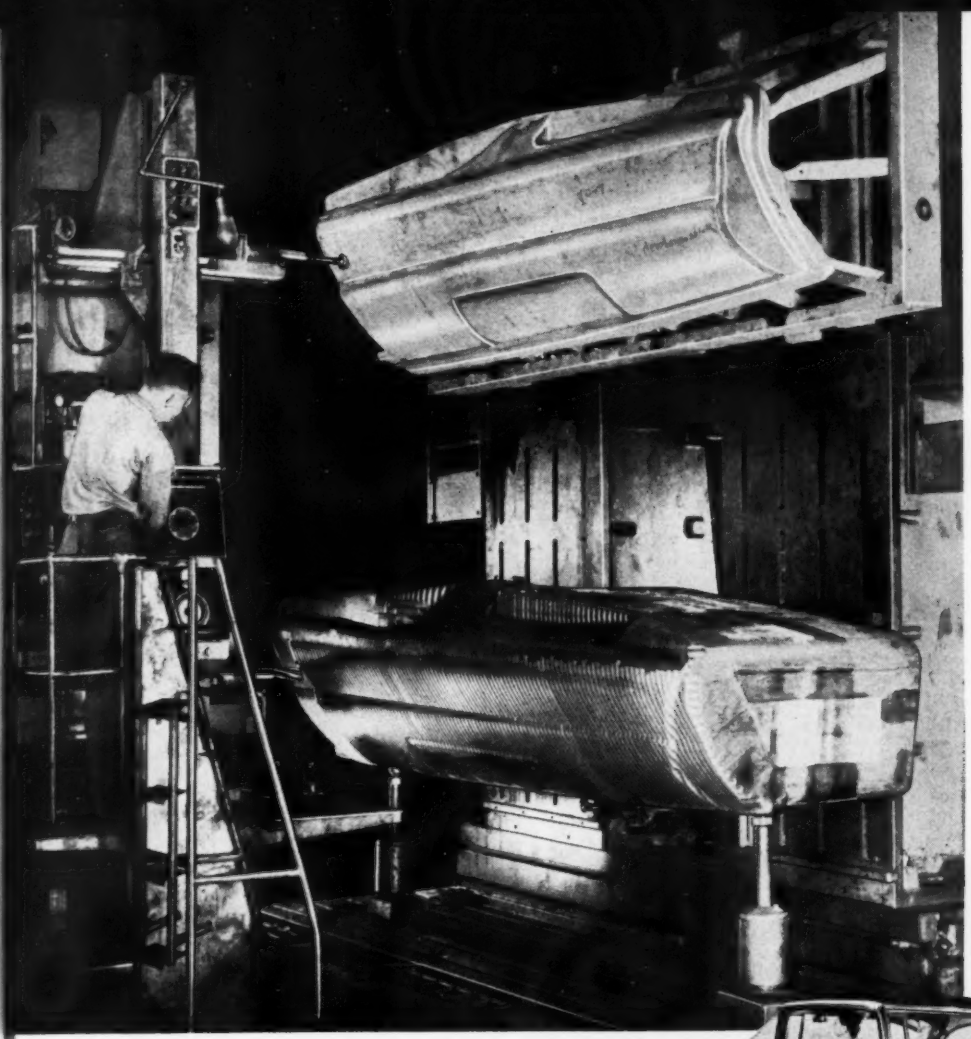
Experience has repeatedly proven that most of the personality conflicts and failures to cooperate effectively on executive levels are due to faulty organizational relationships. Too often, men holding important positions do not know, or choose to ignore, their responsibilities, their authorities, and their relationships to their colleagues. Overlap causes open conflict, and voids create a "no man's land" which is just as bad though less spectacular. A balanced organization structure, described by means of a manual including charts and job descriptions, channels the efforts of each executive toward the achievement of the company's objectives.

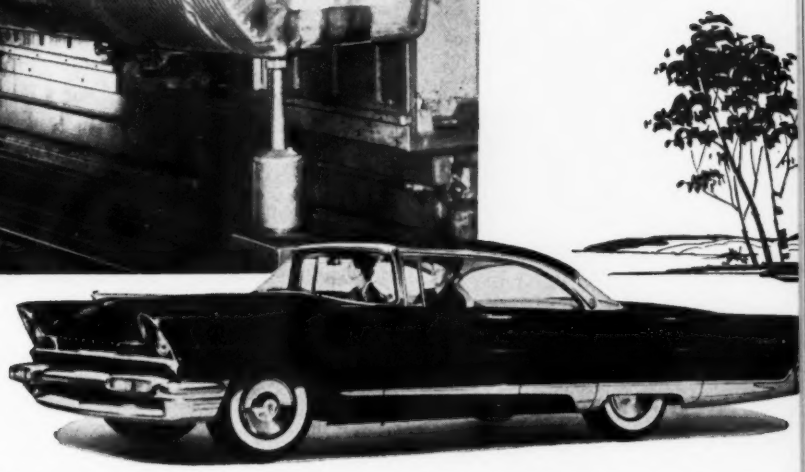
The principles of organization are definite and they can be so delineated that every man in an executive position can adhere to them with the same facility that a locomotive pilot truck follows the railroad tracks. But it is not enough to prepare charts and an elaborate organization manual; the members of the management team must understand the **why** of the organization principles and not merely accept the **what** of the organization plan.

Directing Traits

Mr. White, a professional executive, gets much better results from his subordinates than does Mr. Black. White is not more brilliant; he doesn't pay higher salaries, he doesn't work harder, but somehow people do more for him and complain less. It is no mystery; it is simply the application of well known principles in this specialized field of administration.

. . . *Continued on Page 22*

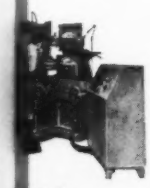




Helps put the "B-G" in the BiG New 1956 LINCOLN

. . . the PRATT & WHITNEY KELLER Type BG-22

Hallmark of Lincoln styling is a distinguished, lithe, trim look with gracefully flowing lines. Producing the huge dies that faithfully translate the designer's drawing board dream into a reality of smoothly formed metal is just one of the jobs done so well by Pratt & Whitney Keller Automatic Tracer-Controlled Milling Machines. Shown here is a big Keller Type BG-22. Following a plaster model, it sculptures the complex contours of a rear quarter panel in solid metal . . . quickly, exactly and, above all, economically.



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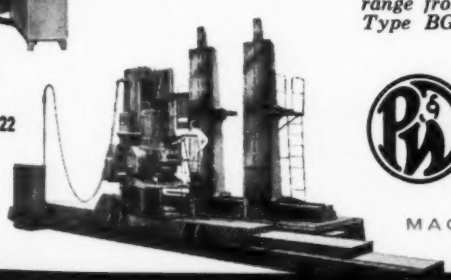

TYPE BL

TYPE BG-22

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1½" thick x 12'

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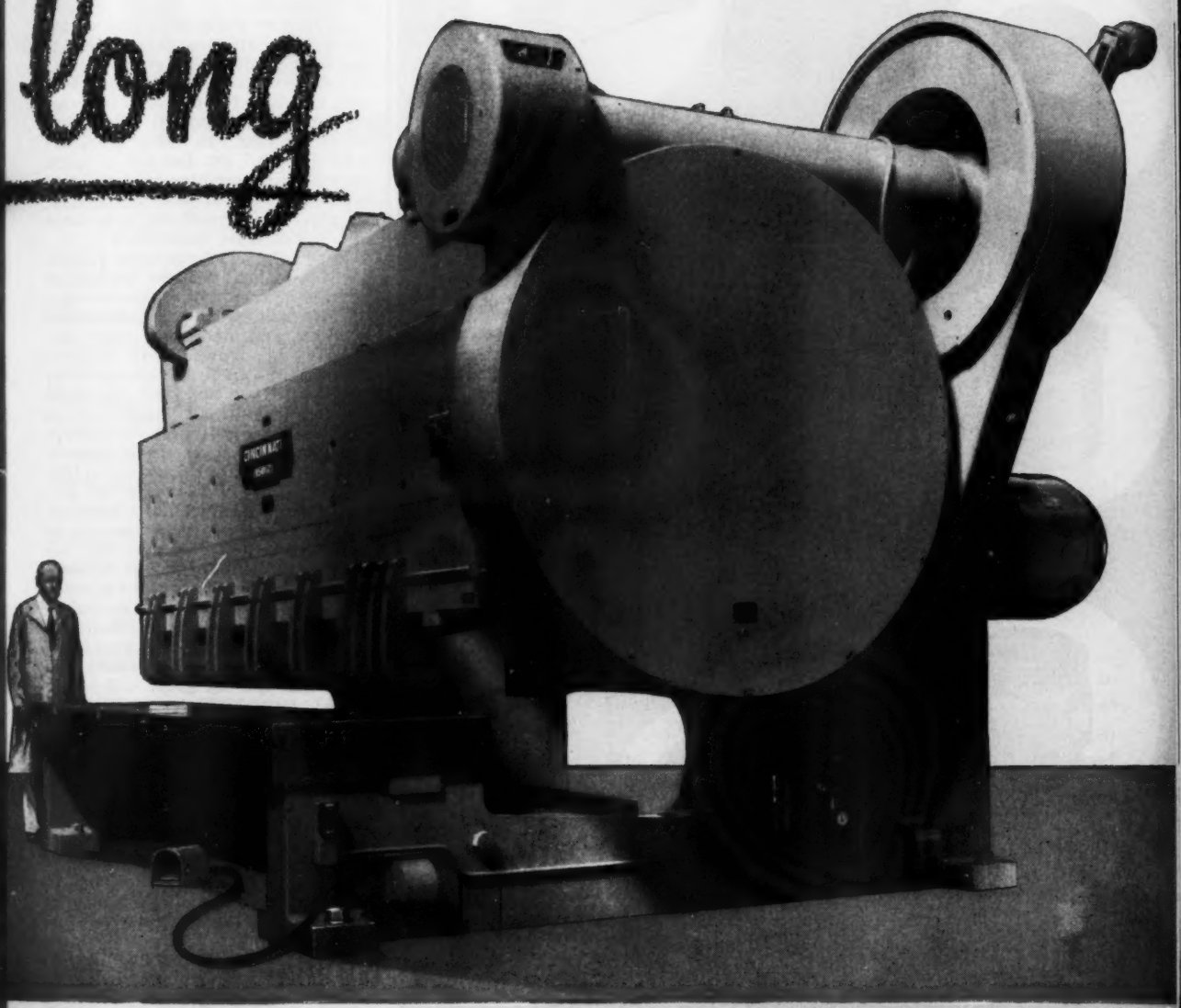

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. . . Talk of Month, from Page 18

Quoting from "The Technique of Executive Control" by M.I.T.'s Professor Erwin T. Schell, "There seems to be a widespread belief that executive skill is a God-given attribute. It is something you have or you haven't. In some measure, this is true." Then Schell says that there are certain qualities that are doubtless in the nature of a birthright but that there is a large number of individuals gifted in moderate degree who can increase their leadership skill by adherence to known executive methods.

As regards traits the leader should possess, Schell lists these three as the outstanding requirements of executive success: (1) interest in and affection for people; (2) power of personality; and (3) a scientific trend of mind. In "Why We Don't Like People," Dr. Donald A. Laird lists the six executive traits he considers as being of most importance, twenty-two of moderate importance and ten of least importance.

The professional executive regards his key men as distinct individuals and he learns what motivates each one; he manifests a personal interest in them and he makes them feel secure. He expects good performance and his men set high standards for themselves and seek to attain them. He asks for suggestions so that his whole staff helps to improve operations and gives credit where it is due. He makes them want to take responsibility rather than let him carry the whole load. He holds up the challenge that tomorrow can be better than today so that they see opportunity ahead instead of mere routine and monotony. The key men then give completely of themselves in making reality out of possibility.

A confident attitude on the part of the leader imbues his followers with faith that the set goals will be attained. Sir Winston Churchill steeled the determination of his people and enlisted the support of even the non-combatant nations when, with England standing alone at the beginning of the war and facing certain defeat, he declared, "We will fight on the beaches, we will fight in cities, we will fight to the last man, but we will never give up our island home." Believing himself to be a man of destiny, and having complete faith in the ultimate outcome, Churchill aroused in the English a spirit of indomitable resistance.

Pride in being a member of a winning team, a sense of security, certainty of recognition, the possibility of personal expression, and the challenge of opportunity, are performance incentives of the first magnitude. The idea that monetary rewards are powerful motivations, of themselves, has been entirely disproved and high salaries do not off-

. . . *Continued on Page 26*

KENNAMETAL K7H

has a definite place in your operations

- for high-velocity machining
- for cutting heat-treated steels
- for cutting high tensile steels

Kennametal* Grade K7H is being selected by shop after shop for high-velocity cutting operations . . . chiefly because of these desirable cutting edge characteristics: High hardness (93.5 Rockwell A) combined with phenomenal strength (three times that of nonmetallics); exceptional wear resistance and maximum resistance to cratering; excellent retention of strength even at high temperatures; and top resistance to shock.

Use Kendex Tooling with turn-over inserts (available in 17 styles and over 200 tools) . . . for lowest cost per cutting edge.

HERE ARE EXAMPLES OF K7H PERFORMANCE

Doubles production: Cutting $1\frac{1}{2}''$ wide stators of welded laminations of 2% silicon steel, K7H has out-performed all other cutting edges by better than two to one, with 147 pieces averaged per index for K7H against only 65 pieces per index with the best competitive carbides. *Conditions:* 900 sfm, .0083″ feed, and .015″ depth of cut. *Results:* Higher total production at end of day, with less machine down time, less scrap, better quality by holding tolerances, and lower tooling cost per stator ($0.00109).

Outperforms ceramics by more than 30 to one in test boring SAE 1020 steel, flash hardened, length of bore $1\frac{1}{4}''$, depth .025″ at 900 sfm. Grade K7H cut 67 pieces while ceramics only cut two (ceramics chipped). *Result:* K7H ordered for the operation.

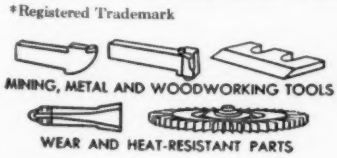
K7H cuts 252 pieces as compared to 30 . . . the best record for a competitive carbide in facing cut to dead center of SAE 1018 steel 5″ O.D. gear blank, at 1000 sfm (at outer edge) and .008″ depth of cut. *Result:* Standardized on K7H.

Performance 3 times greater than with competitive carbide cutting cast steel stator housing with six interruptions at 700 sfm, .014″ feed, and $\frac{1}{8}''$ depth of cut. *Result:* K7H was selected for the job.

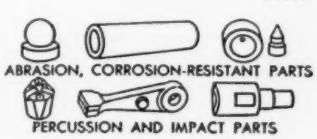
Why not discuss your machining problems with a Kennametal tool engineer. He will help you take full advantage of this remarkable cutting grade. Call him or write KENNAMETAL INC., Latrobe, Pa.

*Registered Trademark

B-5957



INDUSTRY AND KENNAMETAL ...Partners in Progress



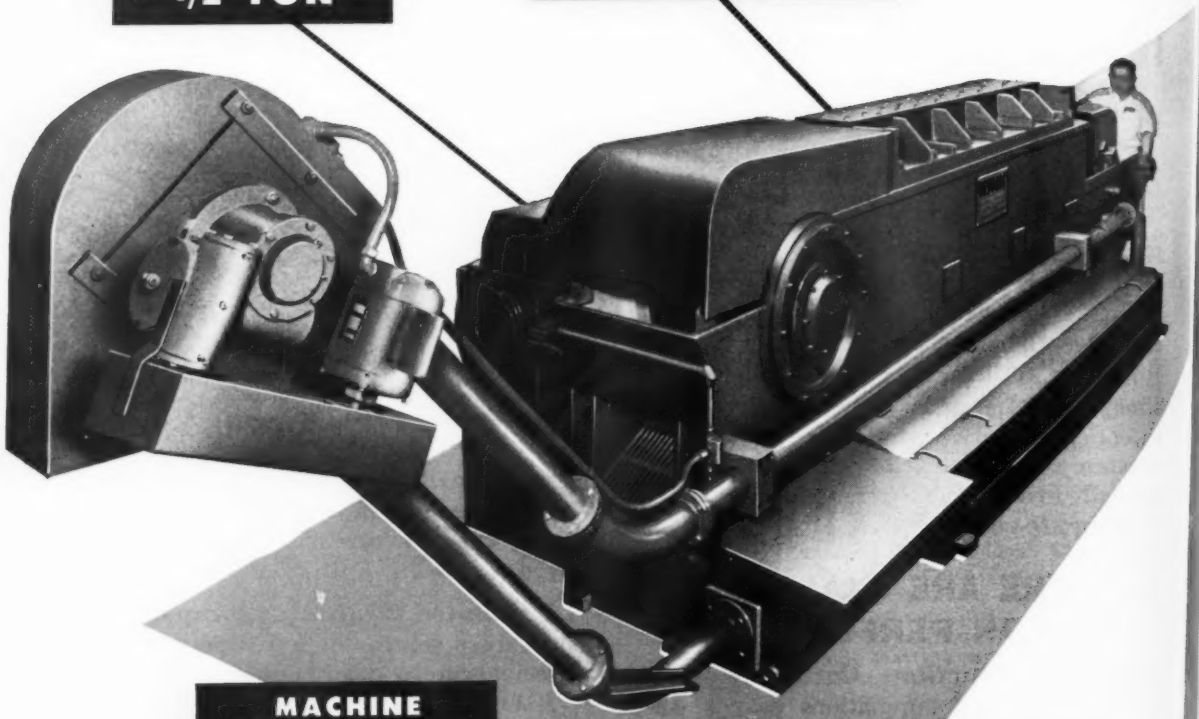
CIRCLE INFORM-A-GRAM KEY NO. 23

MACHINE WORKS, INC. Dept. H
5454 N. Wolcott Ave., Chicago 40, Ill., U.S.A.

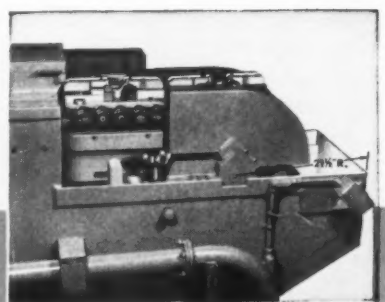
NEW DETROIT Continuous

BULL GEAR
1/2 TON

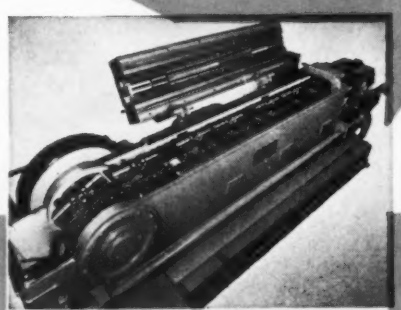
BROACH TUNNEL
13/4 TONS



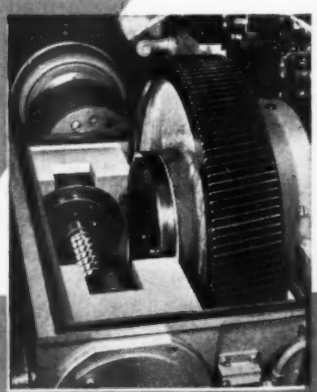
MACHINE
17 1/2 TONS



Note generous radius from chain axis to outer machine frame, 22½" at loading end, 23½" at unloading end. This assures easy, safe handling of wide variety of work sizes and shapes.



Broach tunnel raised to show heavy duty twin chain type drive and automatic kammer lock fixtures. Tunnel and broaches weigh 3,750 lbs., while entire machine weighs 35,000 lbs.



Massive ½ ton bull gear provides positive pulling power and smooth operation required for extremely fine finishes. Gear is directly connected to main drive drum.

BROACH
Horizontal Machine

WEIGHT *where you want it!*

ROOM *where you need it!*

Extreme weight and rigidity are the answers to high-production surface broaching with fine work finishes and long tool life . . . and this husky new Detroit Continuous Horizontal gives you *the most you can get!*

PLUS

- Generous loading and unloading clearances for easy, safe handling of a wide variety of work.
- All-welded, heavy steel plate frame.
- Fully automatic fixture locking, machine operation and unloading.
- Safety interlock assures proper work positioning before operation.
- Heavy-duty, twin chain electric-mechanical drive.
- Simple change gears for varied cutting speeds.
- Entirely self-contained, including automatic chip disposal unit.
- Electric and hydraulic equipment to J.I.C. standards.

Model illustrated is 90" stroke 15-ton capacity with cutting speeds to 40 f.p.m. Other 15-ton models available with 66" and 120" stroke, lower and higher tonnage capacities on request. Send part prints for prompt recommendation and quotation, or mail coupon now for free descriptive literature.

DETROIT BROACH and MACHINE CO.
DEPT. E-7
ROCHESTER, MICHIGAN
OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

DETROIT BROACH and MACHINE COMPANY,
DEPT. E-7, ROCHESTER, MICHIGAN

Please send me free literature on:

- ☐ CONTINUOUS HORIZONTAL BROACHING MACHINE
- ☐ Horizontal Surface Broaching Type
- ☐ Single Ram Vertical Type
- ☐ Twin Ram Vertical Type
- ☐ Pull-Down Vertical Type
- ☐ Broaching Tooling

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COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE____

CIRCLE INFORM-A-GRAM KEY NO. 25

Cut DIE COST WHERE IT COUNTS MOST...

...BEFORE the die gets in the toolroom

Nothing makes a diemaker meaner than a sticky punch holder. Count the number of times he removes that holder building up a die and it's foolish to save a few dollars buying second-rate die sets.

That can't happen with Detroit Die Sets because . . .

. . . **from start to finish, under one roof, Detroit Die Sets are continuously inspected for accuracy, whether it's turning a shank or superfinishing a guide pin. Misalignment doesn't have a chance.**

. . . **we are constantly working to improve our die sets. Recently developed ball bushings are an example. Extensive testing, in our own and customers' plants, has proven their value on certain applications. Now, they're available on Detroit Die Sets to extend production runs as well as making the diemaker's job an easier one.**

Details on the use of ball bushings plus other helpful information on cost-cutting Detroit Die Sets are available upon request. Write today, or see your local representative—he's as near as your phone.

Offices in Principal Industrial Centers

Detroit DIE SET CORPORATION

. . . **Talk of Month, from Page 22**

set the negative effect of a superior's deficiencies.

Directing Techniques

A staff executive discussing his old-school executive vice-president said, "He may be a good guy at heart but when he invites our suggestions, he picks flaws in every idea and never sees the forest for the trees." How common this situation used to be!

The professional executive formulates a course of action by conferring with his executive committee, or independently, or by some means between these two extremes, depending on the management level of his position.

He explains the objective and the details of his plan for attaining it, and inquires whether he has been fully understood.

He asks the individual to whom he has assigned the task whether he has a better way of arriving at the end result. If not,

He sets up, or requires his subordinate to establish, a time schedule for checking progress and he requests periodic reports.

He determines standards of performance and indicates the limits within which discretionary action may be taken and beyond which prior authorization must be obtained.

When performance departs from plan he marshals his forces to give aid to the beleaguered.

Finally, when the goal has been reached he appraises the performance in terms of the situation. Differentiating between avoidable and unavoidable handicaps, he gives recognition where due or, if it is indicated, advice to prevent future mistakes.

Thoughout the whole procedure he makes himself available for help either as advisor and coordinator of allied activities or as spearhead when the prestige of his position makes it possible for him to accomplish something beyond that which an executive on a lower level can do.

Coordinating

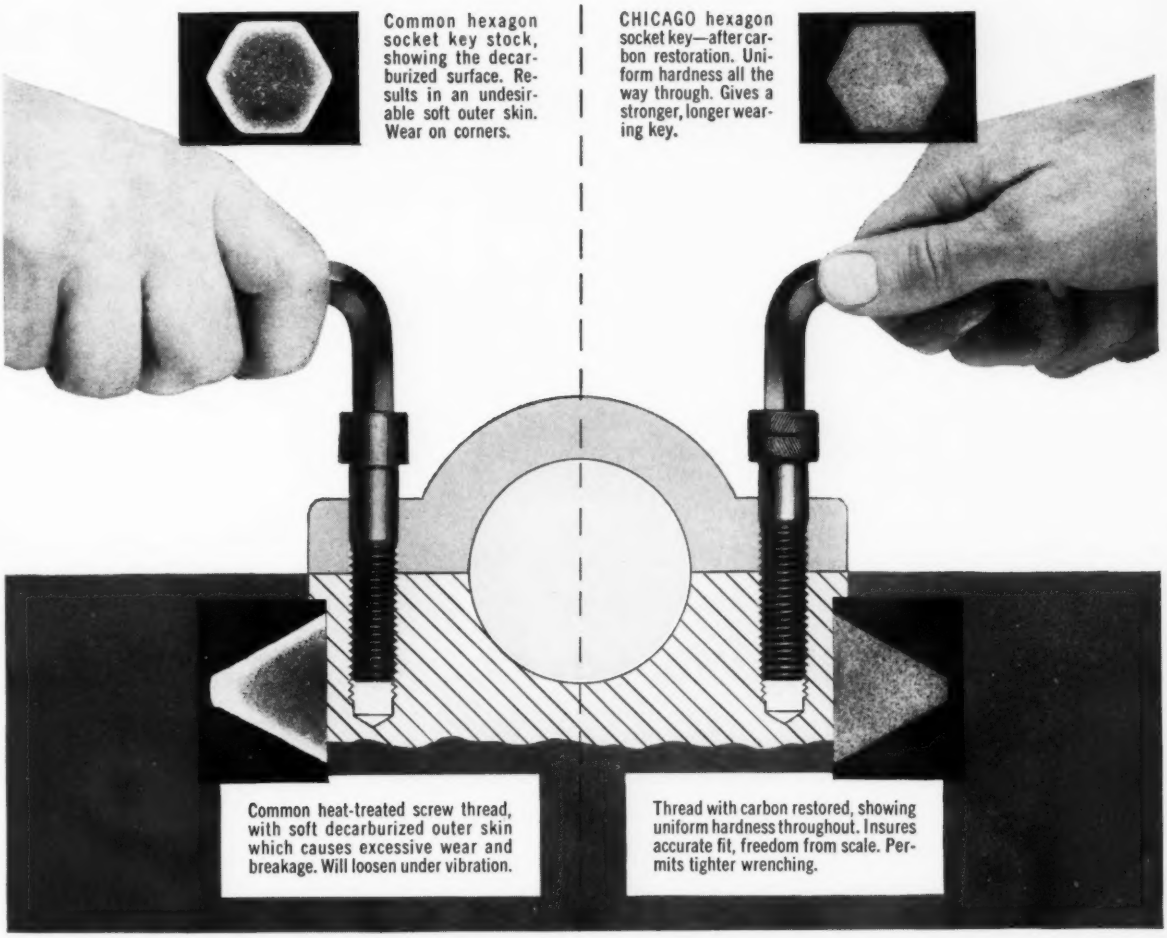
Another function of administration has to do with unifying and synchronizing the team effort; seeing that each unit understands its part in each project in order to stimulate, rather than neutralize, cooperation.

As corporations expanded in size, channels of communications — **up, down** and **across** the organization structure — became necessary. Yesterday's executive told his subordinates what to do, and considered it unnecessary to explain why or acquaint them with the overall plan. The professional executive practices consultative management and he encourages his department heads to do likewise by holding regular conferences with their people to discuss goals, progress, and departmental problems.

. . . *Continued on Page 31*

How carbon affects fastener performance

Screw fasteners may look identical, but the microscope reveals a wide difference in their ability to "take it"


Common hexagon socket key stock, showing the decarburized surface. Results in an undesirable soft outer skin. Wear on corners.
CHICAGO hexagon socket key—after carbon restoration. Uniform hardness all the way through. Gives a stronger, longer wearing key.
Common heat-treated screw thread, with soft decarburized outer skin which causes excessive wear and breakage. Will loosen under vibration.
Thread with carbon restored, showing uniform hardness throughout. Insures accurate fit, freedom from scale. Permits tighter wrenching.

The ability of a screw fastener to *stay* fastened depends to a great degree on its uniform hardness. And the hardness of steel hinges on the precise amount of carbon in its structure. However, during steel manufacture and processing, vital surface carbon is inevitably lost. As the above photomicrographs show, lack of surface carbon results in a soft outer skin in the finished fastener. Decarburized outer layers are the cause of many fastener problems: thread stripping, fatigue failure, excessive wear, loosening under vibration, soft corners on socket keys that turn off during use.

The soft "decarb" layer is eliminated by the unique *"Carbon Restoration"* process used by The Chicago Screw Company. In this process, surface carbon is replaced during heat treating, producing a fastener that is uniformly hard from core to surface! The amount of carbon restored is precisely controlled to give maximum hardness without excess carbon build-up. The *Carbon Restoration* process also results in bright hardening and freedom from scale.

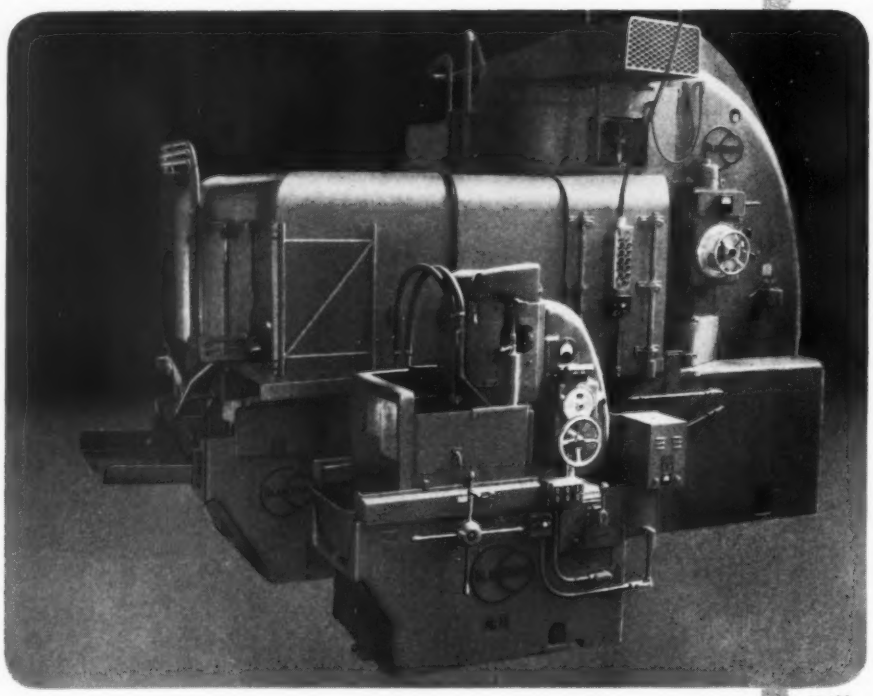
All CHICAGO "Safety-Plus" Socket Screw Products and heat-treated cap screws have the benefit of *Carbon Restoration* plus complete quality control procedures from raw material to finished fastener. If you would like complete information and catalog, simply write our Standard Products Division.

THE CHICAGO SCREW COMPANY

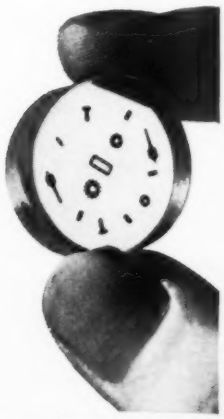
DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872

2519 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

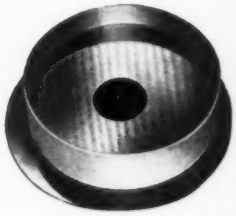
CIRCLE INFORM-A-GRAM KEY NO. 27



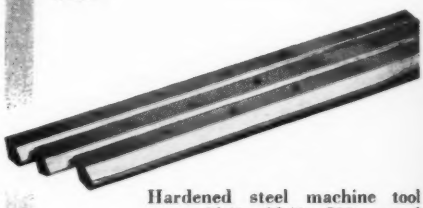
V-488



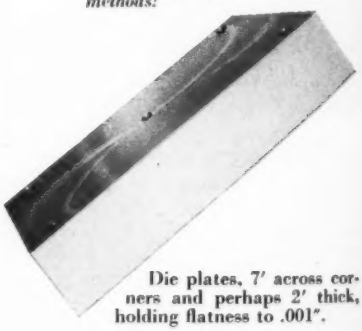
Tiny watch gears, pinions and ruby bearings — flat and parallel — to a dimension tolerance of .0002″.



To 3 micro-inches and flat within *one* light band.



Hardened steel machine tool ways, 2½″ x 3½″ x 50″, ground on 6 sides, flat within .001″ with surface finish of 5 micro-inches — *5 times faster than other methods!*



Die plates, 7′ across corners and perhaps 2′ thick, holding flatness to .001″.

Please

give us a chance!

We *know* we can do *your* flat surface jobs. We've done them all — tiny watch parts . . . steel plates 7 feet across corners . . . copper and ceramics . . . *perfectly*. Just give us the correct wheel . . . (Blanchard wheels are preferable).

Blanchards regularly grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001″, with dimension tolerance of .0002″ and surface finish to better than 3 micro-inches.

Honest, we Blanchards (15 models) work fast and inexpensively — whether the job requires precision grinding or rapid removal of stock. Give us a chance to prove we're the best investment you ever made.

Send for free copies of "Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 28

WITH VERS-O-TOOL HEADS

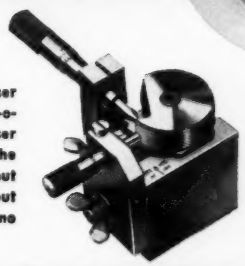
you get *PRODUCTION* advantages on any job requiring end-forming, turning, thread cutting

QUICK, SIMPLE CHANGE-OVER

Vers-o-tools provide for quick removal of threading chasers (or milling cutters) on their holding blocks—without disturbing head adjustment or set-up.

NO "CUT-AND-TRY" REQUIRED

Take the guess-work out of chaser grinding with the "Namco Vers-o-tool System": sharpen each chaser on its holding block, then check the grind on Namco micrometer gage; put the set back in the head without need for further adjustment—no "cut-and-try" required.



MANY REGRINDS PER SET

You can grind and regrind 270 usable degrees of Namco chaser circumference—one set cuts more threads than 10 sets of conventional chasers.

use the same Vers-O-Tool Head . . . change only cutters and blocks

THREADING

END-FORMING

END-TURNING

TURNING-THREADING

KNURLING

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FOR COMPLETE DETAILS SEND FOR BULLETIN DT-52

National Acme

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CIRCLE INFORM-A-GRAM KEY NO. 28

Now... Gorton Milling Machines Feature Hydraulic 3-Dimensional Controls

"Pencil Pressure" Does the Work

Gorton now offers you several models of Super-Speed Vertical Mills equipped with sensitive and accurate hydraulic controls featuring feeds up to 40 inches per minute.

AVAILABLE 3 WAYS

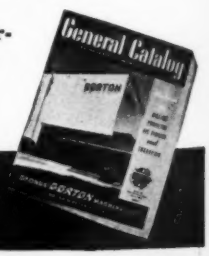
1. **Vertical action only**
2. **Cross and longitudinal**
3. **Three-dimensional combination**

Gorton Milling Machines with hydraulic Tracer Control must be ordered as such. Hydraulic equipment is not an attachment but a permanent installation.

For die or mold work (single or multiple units), production profiling and duplicating — short runs, experimental pieces or high production.

Gorton also offers manual and automatic Tracer-Controlled Milling Machines and Pantographs for 2- or 3-dimensional operation; 1 to 1 ratio, or reproduction at variable reductions, with single or multiple-spindle machines for work of any shape or size.

Shown above: Gorton 9-J Super-Speed Vertical Mill with True-Trace hydraulic installation.



Write for Form 2697-ADS and 1207-1655 General Catalog.

GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1207 RACINE STREET • RACINE, WISCONSIN, U.S.A.

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A 8731-1P

CIRCLE INFORM-A-GRAM KEY NO. 30

. . . Talk of Month, from Page 26

Properly handled, such meetings encourage whole-hearted participation by everyone; they are not dominated by the department head and executive decisions are made with consideration of the opinions expressed. Under consultative management, the policies and decisions agreed upon by top management groups are interpreted to groups **down** the line so, that, by being clearly understood, they may be properly and purposefully implemented.

The groups on the various lower management levels present their own suggestions, which have grown out of their experience for making policies work more effectively, with complete assurance that their ideas are welcome to their superiors. Thus, these meetings also provide communication **up** the line or organization. Then, as department heads horizontally clear with each other through periodic conferences, there is communication **across** the organization. Consultative management thereby provides the three-way communication so essential to effective coordination.

Controlling

With the exception of organizing, perhaps no phase of administration offers greater opportunity for progress than the so-called control function. What does it deal with, and how should it operate?

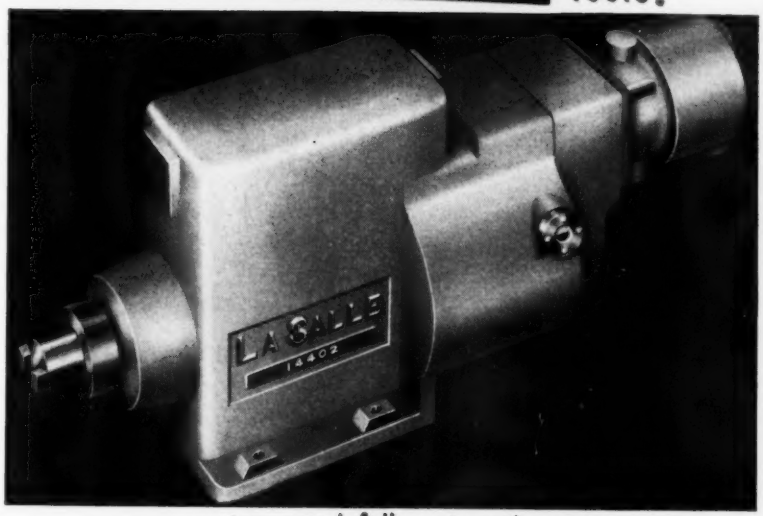
Control is obtained by (1) being informed of performance; (2) interpreting trends and predicting results; (3) knowing where, when, and how to take remedical measures; and (4) taking executive action.

The professional executive controls with a minimum of restriction, which is quite different from the procedure used by yesterday's authoritarian. The latter required others to secure his approval even when minor decisions were necessary. He declined to state policies or issue standard procedures because it might curtail his flexibility. Sometimes he even encouraged stooges to report to him surreptitiously. Thus he was constantly deciding, approving, and checking up on specifics. He was, in fact, indispensible; he felt very important, and too often he liked it. Because his subordinates could not predict his reactions, they were afraid to show initiative and, therefore, there was little procedural improvement.

The modern executive, on the other hand, is critical of himself whenever he has to act for a subordinate. He controls through clear cut policies; through clear definitions of authority; and through decisions on exceptions rather than on routine trivia. As a consequence, he gets better performance with less effort and worry. Fewer mistakes are made because his men know what to do, how it should be done,

. . . *Continued on Page 32*

La Salle AUTOMATIC POWER WRENCH practically eliminates breakage of cutting tools!



IT'S NEW!

two-speed fully automatic power

It's synchronized with the machine cycle to give you automatic engaging and disengaging of parts. Controlled torque eliminates positively all guesswork in clamping pressure.

operates on machine tool principles

A high speed low torque approach; a low speed high torque clamping; and a low speed high torque break clamp and a high speed low torque return.

STARTLINGLY DIFFERENT!

features fluid motor drive

You can clamp light parts or parts with thin-walled areas without fracturing and you can always repeat the clamping torque from cycle to cycle.

fits any type of production machine

They're designed to fit any special or any standard machine in use today—such as Multiple-Drilling Machines, Lathes, Boring Mills, Grinders, Screw Machines or Thread Millers.

GOOD NEWS FOR PRODUCTION MANAGERS!

unit mounted quickly

The design permits either vertical, horizontal or angular mounting—to serve your particular needs.

now available in two standard sizes

Smaller model has a torque capacity up to 1200 inch/pounds; larger model from 800 to 5000 inch/pounds. To control and regulate properly a hydraulic power package is provided.

La Salle tool, inc.

ENGINEERING & BUILDING SPECIAL MACHINERY

3840 East Outer Drive • Detroit 34, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 31

It's RESULTS that count!

Speedier OUTPUT... ECONOMY... UNIFORMITY

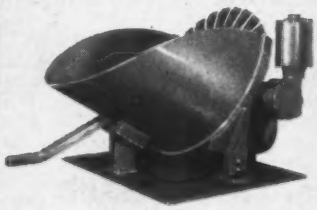
That's what you get when you use

DPS POWER METHODS on your ASSEMBLING and FEEDING JOBS

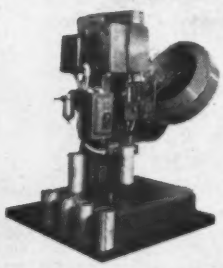
Let these mechanical helpers bring you more profitable results.

Write Today, ask for Catalog!

BOWL FEEDER
Vibratory type, to select and feed smaller fragile parts.



BARREL FEEDER
with stationary ring cover, for heavy-duty, large production runs



SPECIAL ASSEMBLING MACHINES
For light assembly operations using Selective Parts Feeders to feed component parts

BARREL FEEDER
Conventional type, for parts requiring critical selection

5 SCREWDRIVING MACHINES
Bench and Pedestal types. Pedestal Model A pictured

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Talk of Month, from Page 31

when to decide, and when to get approval. The release of initiative and the assumption of responsibility is reflected in greater productivity all down the line. It develops the key persons for future promotions and it conserves the manager's time. That kind of controlling is much more effective as well as being easier on the boss's nerves.

In large and complex organizations the professional executive uses Control Units to extend his time and capacity, when the activity for which he is responsible is too large or involved for him alone systematically to watch results. These control units report directly to the chief executive and the heads of them must have his complete confidence. The control personnel has the right of access to any part of the organization and to any information or data therein. They operate through field investigations, and the systematic collection and analysis of facts. Their mission is to report actual performance in relation to plan and time schedule and it is done openly, impersonally, and constructively. This idea, with modification, has also been successfully used in small companies.

Summary

The administrative phase of management is evolving in keeping with the changing demands of the times.

Managing, particularly on the upper levels, has achieved the status of a specialty, and courage, capital or an intimate knowledge of personal sales, for example, does not qualify an individual for the top job.

Paralleling the evolution in management has been a greater increase in corporate productivity than could be accounted for by the expansion in production facilities.

Yesterday's management will surely fail under today's conditions. Today's techniques are more consonant with our ideals as well as being more certain in effecting a successful outcome of a business venture.

Knowledge of modern management principles is available to all and to him who sows and tills goes the harvest.

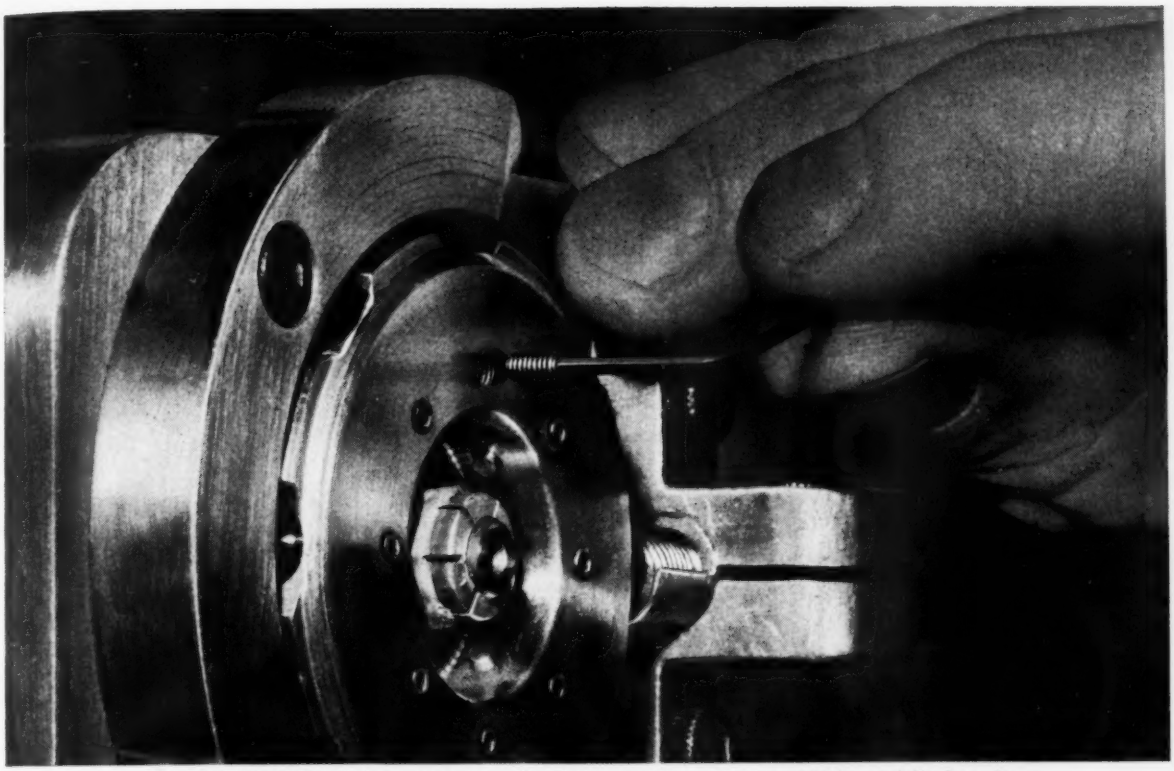
The principles of modern directing apply to all executive levels.

These are the criteria we use to appraise the administrative skill of an executive:

1. **Does he put principle first?** Are his subordinates stimulated to performance far beyond the call of duty; will they go to Hell for him because of his lofty ideals? Does he prevent trouble by a soundly conceived plan, or depend on agility and expedience to get him out of it after it occurs?

2. **Does he protect his immediate subordinate?** Can able key men depend on his support when they are challenged but in the right? Is he interested in their economic security? Does he volunteer his help

. . . *Continued on Page 38*



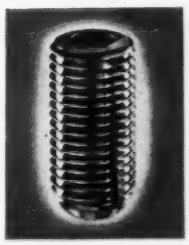
Microsize UNBRAKO socket screws simplify design problems—even in highly specialized equipment like this prototype precision loading device for use in advanced automated production operations.

Miniaturize with UNBRAKO set screws

HEAT-TREATED ALLOY STEEL*
PLAIN CUP POINT
Class 3 Fit Standard

Diameter		Threads per inch NC	Threads per inch NF	L Overall Length	Recommended Installation Torque in Inch-Pounds NC	Recommended Installation Torque in Inch-Pounds NF	Weight per Box of 100 in Pounds
#0	D .060 F .028	..	80	1/16	..	.5	.01
		..	80	3/32	..	.5	.01
		..	80	1/8	..	.5	.01
		..	80	5/32	..	.5	.01
		..	80	3/16	..	.5	.01
		..	80	1/4	..	.5	.01
#1	D .073 F .035	..	72	1/16	..	1.5	.02
		..	72	3/32	..	1.5	.02
		..	72	1/8	..	1.5	.02
		..	72	5/32	..	1.5	.02
		..	72	3/16	..	1.5	.02
		..	72	1/4	..	1.5	.02
#2	D .086 F .035	56	..	1/16	1.5	..	.03
		56	..	3/32	1.5	..	.03
		56	..	1/8	1.5	..	.03
		56	..	5/32	1.5	..	.03
		56	..	3/16	1.5	..	.03
		56	..	1/4	1.5	..	.03
#3	D .099 F .050	48	..	3/32	5.0	..	.04
		48	..	1/8	5.0	..	.04
		48	..	5/32	5.0	..	.04
		48	..	3/16	5.0	..	.04
		48	..	1/4	5.0	..	.04

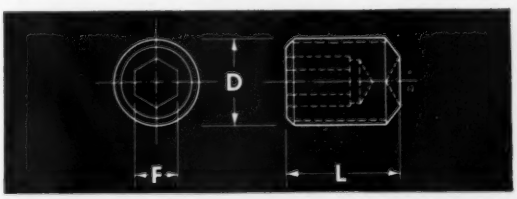
*Also available in stainless steel



You need not design special set screws to secure your new miniaturized equipment. Microsize UNBRAKOS were developed specifically for use in modern small devices.

UNBRAKO screws are made of carefully selected alloy steel. They are manufactured to timepiece precision. Sockets are deep and uniform for greatest wrench engagement and longest reuse. Threads are fully formed for maximum strength and exact fit. And UNBRAKOS are heat treated to the optimum condition for high tensile strength and ductility without brittleness or decarburization.

Ask your authorized industrial distributor about microsize UNBRAKO socket screws today. Or write us for Bulletin 2055 and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.



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UNBRAKO SOCKET SCREW DIVISION
SPS
JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 33

It's RESULTS that count!

Speedier OUTPUT... ECONOMY... UNIFORMITY

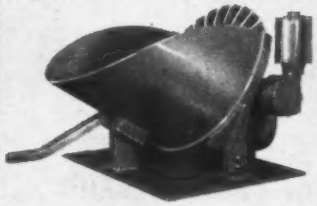
That's what you get when you use

DPS POWER METHODS on your ASSEMBLING and FEEDING JOBS

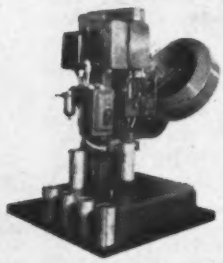
Let these mechanical helpers bring you more profitable results.

Write Today, ask for Catalog!

BOWL FEEDER
Vibratory type, to select and feed smaller fragile parts.



BARREL FEEDER
with stationary ring cover, for heavy-duty, large production runs



SPECIAL ASSEMBLING MACHINES
For light assembly operations using Selective Parts Feeders to feed component parts

BARREL FEEDER
Conventional type, for parts requiring critical selection

5 SCREWDRIVING MACHINES
Bench and Pedestal types. Pedestal Model A pictured

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Talk of Month, from Page 31

when to decide, and when to get approval. The release of initiative and the assumption of responsibility is reflected in greater productivity all down the line. It develops the key persons for future promotions and it conserves the manager's time. That kind of controlling is much more effective as well as being easier on the boss's nerves.

In large and complex organizations the professional executive uses Control Units to extend his time and capacity, when the activity for which he is responsible is too large or involved for him alone systematically to watch results. These control units report directly to the chief executive and the heads of them must have his complete confidence. The control personnel has the right of access to any part of the organization and to any information or data therein. They operate through field investigations, and the systematic collection and analysis of facts. Their mission is to report actual performance in relation to plan and time schedule and it is done openly, impersonally, and constructively. This idea, with modification, has also been successfully used in small companies.

Summary

The administrative phase of management is evolving in keeping with the changing demands of the times.

Managing, particularly on the upper levels, has achieved the status of a specialty, and courage, capital or an intimate knowledge of personal sales, for example, does not qualify an individual for the top job.

Paralleling the evolution in management has been a greater increase in corporate productivity than could be accounted for by the expansion in production facilities.

Yesterday's management will surely fail under today's conditions. Today's techniques are more consonant with our ideals as well as being more certain in effecting a successful outcome of a business venture.

Knowledge of modern management principles is available to all and to him who sows and tills goes the harvest.

The principles of modern directing apply to all executive levels.

These are the criteria we use to appraise the administrative skill of an executive:

1. **Does he put principle first?** Are his subordinates stimulated to performance far beyond the call of duty; will they go to Hell for him because of his lofty ideals? Does he prevent trouble by a soundly conceived plan, or depend on agility and expedience to get him out of it after it occurs?

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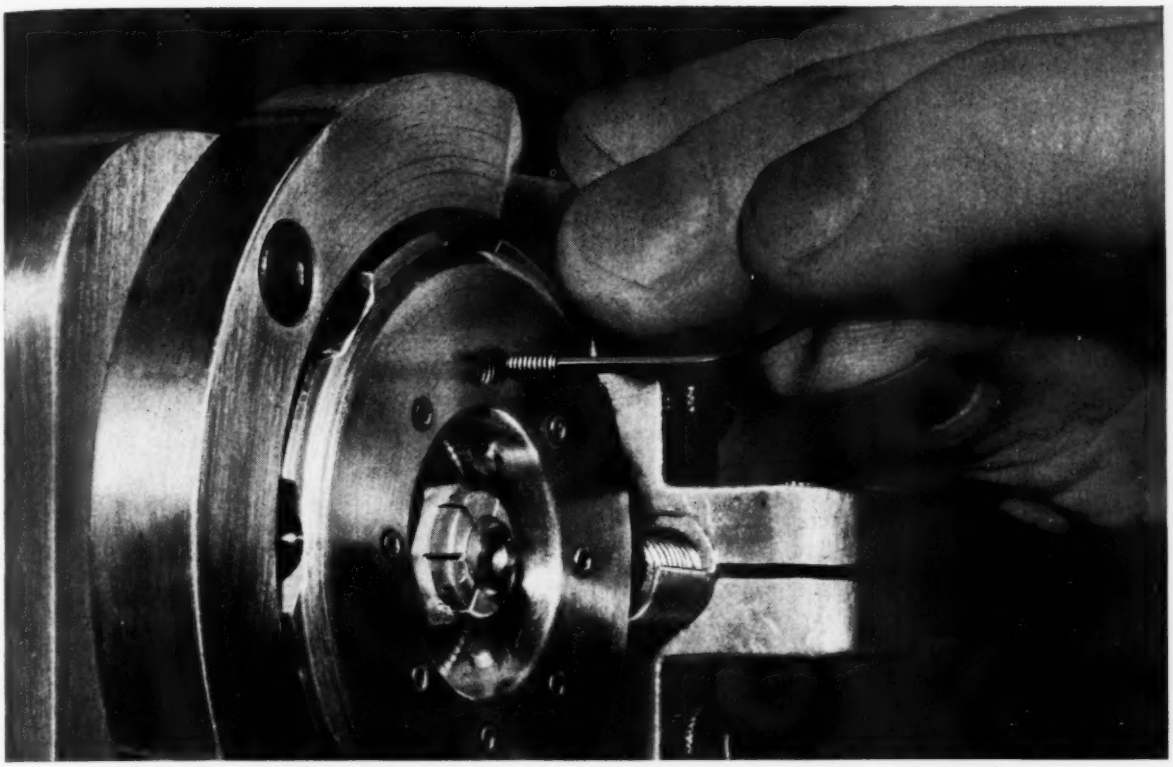

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		..	80	3/16	..	.5	.01
		..	80	1/4	..	.5	.01
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		..	72	3/32	..	1.5	.02
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		56	..	3/16	1.5	..	.03
		56	..	1/4	1.5	..	.03
#3	D .099 F .050	48	..	3/32	5.0	..	.04
		48	..	1/8	5.0	..	.04
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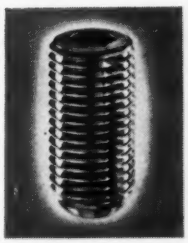
*Also available in stainless steel



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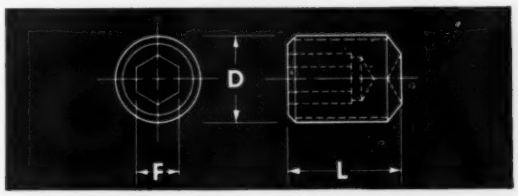


STANDARD PRESSED STEEL CO.
UNBRAKO® SOCKET SCREW DIVISION SPS
JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 33

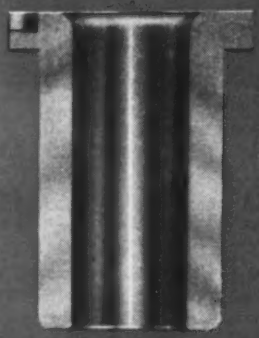
2827 W. FORT ST. DETROIT 16, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 32

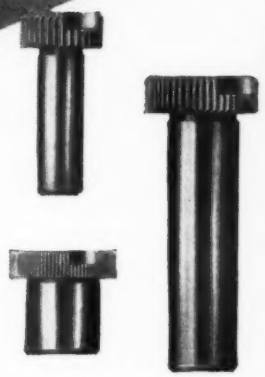
for accuracy in your production
it pays to specify

UNIVERSAL DRILL BUSHINGS

In Universal you get the best. Machined from finest quality steel. Blended radius on the top-inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip.



superfinish bores
lengthen tool life
The superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum—especially in close tolerance work.



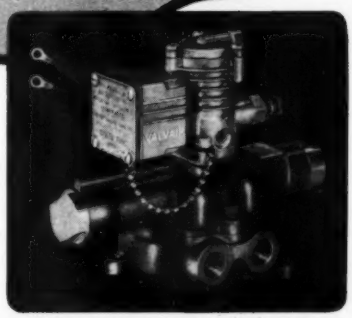
Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

Write for your copy of our new 98 page catalog describing Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holder, Mikro-Lok Boring Bars, Standard Drill Bushings, Universal Index Plungers and other Universal products.

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 34

Compare... and you'll buy VALVAIR



Single Solenoid Speed King built to JIC standards. Guaranteed against coil burnout for life of valve.

Perhaps you're puzzled over which make of valve to buy. Or confused by a welter of unsupported *claims*. Some valves feature this advantage, some feature that.

But put them all together. Sift fact from fallacy. Match actual performance *records*. Compare *quality*, *workmanship*, *guarantee*—and you'll arrive at one inescapable answer. It's —*Valves by Valvair*.

Add to this Valvair's alert sales-service organization in all leading industrial areas . . . Valvair's rapid delivery from stock. No matter what your requirements in air, hydraulic and vacuum control valves—specify *Valves by Valvair*. Valvair Corporation, 454 Morgan Avenue, Akron 11, Ohio.

AA-3347

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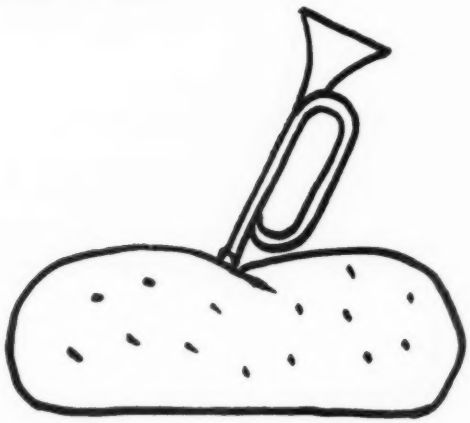
DROODLES

by ROGER PRICE

J&L



Bench Model BC-7D

Floor Model FC-30

Floor Model FC-14

"CRUMPET BLOWING A TRUMPET"

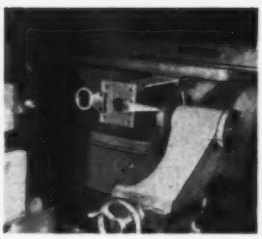
Certain readers, such as plumbers and others who have a keen eye for valves, will protest that this is not a trumpet, but a bugle. And they're right. *But* . . . I'd just like to point out one thing — bugle doesn't rhyme with crumpet.

Anyway, this crumpet is trying to sound the call for the leaven o'clock jam session, but is getting nowhere, because the mouthpiece is clogged with caraway seeds. Talking of music: here at Shady Knoll Rest Farm, where I live, they allow only Wayne King records. The Dean (a kindly soul, but a real square) says anything else might excite us guests, and he "don't want no problems".

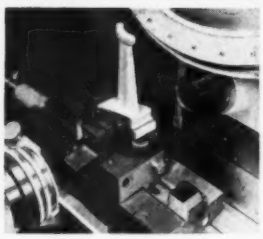
Quality control and inspection men don't want no problems, neither. That's why they use the J&L Comparator to inspect and measure all sorts of parts and objects. The J&L Comparator is a precision instrument that is stupefyingly versatile, accurate to .0001", and is equally suited to both production-line and job-shop work. Forsooth, 'tis the nuts, because it allows you to perform inspections that just can't be done by any other method. Available in eleven bench and pedestal models. For complete information, write Dept. 710 *today*.

JONES & LAMSON OPTICAL COMPARATORS

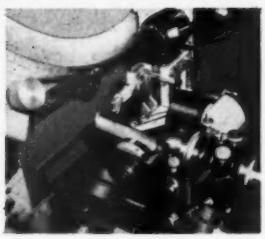
Precise . . . Rapid . . . Flexible . . . Easy to operate



A coordinate tracer probes into narrow areas and accurately records the contours of the blades of rotors and stators of hydraulic transmissions, gas turbines, superchargers and similar devices. Positioning is within .001".



Jet engine blades and vanes can be fitted on the Comparator independently of the mating part. The part is held in a fixture, and its enlarged shadow falls within lines on the chart that define its shape.



Electronic proximity tracers inspect jet engine blades, transmission vanes, and wind tunnel models that would be deflected under ordinary tracing pressure. A long thin probe traces otherwise inaccessible contours.

JONES & LAMSON

World's Largest Manufacturer of Optical Comparators since 1919

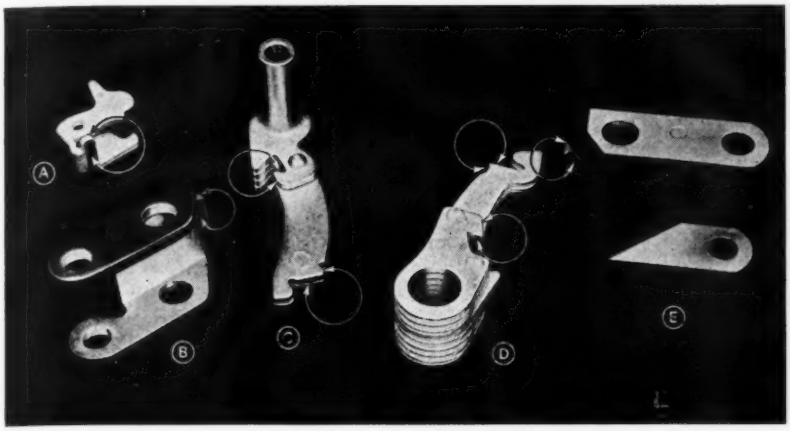
JONES & LAMSON MACHINE COMPANY, 518 Clinton St., Springfield, Vt., U.S.A.

OPTICAL COMPARATOR DIV.

CIRCLE INFORM-A-GRAM KEY NO. 36

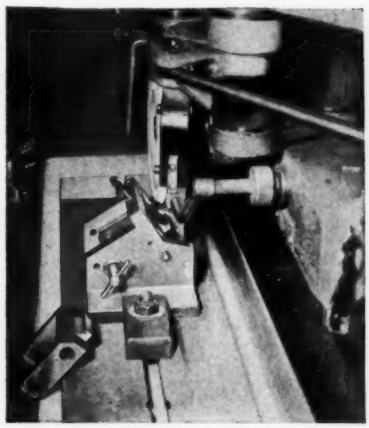
How to take the guesswork out of contour-grinding

Moore Panto-Crush Wheel Dressers Step Up Latch Output 30% for I-T-E, Assure Interchangeability of Parts.



Five principal I-T-E circuit breaker parts finish ground with Moore Panto-Crush Wheel Dresser. Surface areas between arrows are ground. A comparison of pieces per hour between new method and old method follows:

Part	Moore Panto-Crush	Old Method	Saving
A	22	15	33%
B	32	22	31%
C	31	18	42%
D	14	12.5	10%
E	25	17	32%



Contour grinding of latch level—Part "E" at left. Here two surfaces and two radii, including inside fillet, are being ground simultaneously.

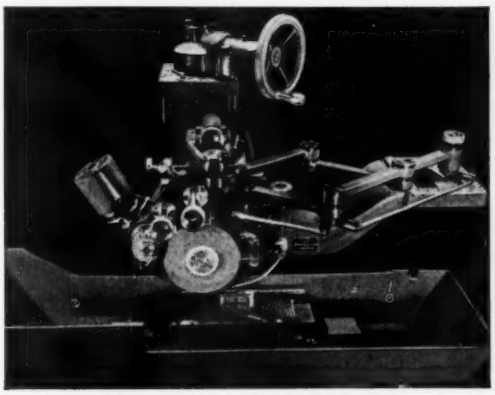
I-T-E's experience with Panto-Crush Wheel Dressers was fully reported in "American Machinist." We'll gladly send you a reprint and our catalog.

They've taken the "by-guess-and-by-gosh" out of the contour-grinding of toggle latches at I-T-E Circuit Breaker Company, Philadelphia, switchgear manufacturers. Moore Panto-Crush Wheel Dressers have solved the problem of accurate, interchangeable production of these moving mechanical parts so essential to faultless circuit breaker operation.

Irregular contours are now ground by wheels diamond-dressed to exact dimensions within .0002". Before installing Moores, I-T-E ground the contours by shifting the parts at different angles. Accuracy and field interchangeability suffered. Today both are completely satisfactory, and output itself is up 30%!

The Panto-Crush is mounted on the wheel spindle of a surface grinder. It is the only wheel dresser combining a precision-built pantograph for guiding the diamond from a template and a self-driven crush former. You switch from one to the other without removing workpiece.

MOORE SPECIAL TOOL COMPANY, INC.
726 UNION AVENUE, BRIDGEPORT 7, CONN.



Moore Panto-Crush Wheel Dresser

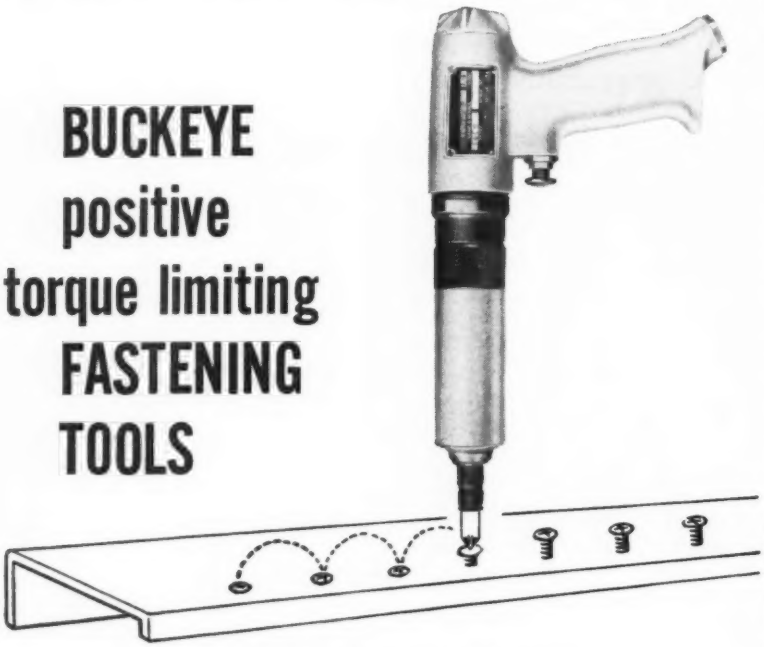
ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • COMPLETE LINE OF HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 37

a NEW way... to drive screws...to run nuts...

BUCKEYE positive torque limiting FASTENING TOOLS



Maintain Uniform Tightness
adjusts to any torque from 5 to 85 in./lbs.

Set the torque—just once—at any point between 5 and 85 in./lbs., and this Buckeye Torque Limiting Fastening Tool is ready to go! Apply the tool to the work—it sets itself for driving—AUTOMATICALLY . . . and it stays set even if you vary the pressure on the tool. The instant the screw or nut hits home, and that pre-set torque is reached, the tool clutch disengages—AUTOMATICALLY, even if the operator maintains pressure on the tool. Now, remove the tool from the work and it will re-set itself—AUTOMATICALLY.

Simple. Foolproof. Every fastener is just as tight as the one before. The workpiece doesn't get scratched or damaged. The fasteners won't strip or shear. And your bits and sockets will last longer, too.

If you aren't doing your fastening work this NEW way, with a Buckeye Torque Limiting Fastening Tool, better write —NOW—for complete information. Better still, why not ask for an in-plant demonstration—there's no obligation.

Buckeye Tools CORPORATION
DIVISION 19 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

CIRCLE INFORM-A-GRAM KEY NO. 38

. . . Talk of Month, from Page 32

when sticky problems have to be solved? Do his followers have confidence in his judgment?

3. **Do his subordinates enjoy being in his presence?** Does he win their support and their loyalty because they really like him personally?

4. **Does he give his men opportunity?** Are the key members of the team fired with zeal because of future possibilities?

5. **Do his administrative methods reflect the scientific approach to problems?** Does he collect the facts, analyze the situation, draw logical conclusions and let the indicated action disclose itself, or does he depend on intuition? Does he have a comprehensive system of communication? Does he delineate job boundaries? Does he acquaint his men with the standards by which their performance will be judged? Does he delegate authority commensurate with responsibility? Does he offer his help when needed?

6. **Does he follow the chain of command?** Are his relationships limited to those directly under him or does he go around them when issuing orders and receiving reports?

7. **Is he courageous?** Does he shrink from doing the disagreeable thing when the welfare of the team is in jeopardy?

8. **Does he follow through?** Does he demand progress reports and see a project through to a successful conclusion or does he trust to the vagaries of chance?

9. **Are his internal audits made overtly?** Does he have an invisible force reporting to him in confidence?

10. **Is he decisive?** Does he act promptly with due consideration of proper timing, or does he procrastinate?

11. **Is he predictable?** Is he the solid citizen type who can be depended upon to react in a predetermined way when faced with a given set of circumstances, or does he act impulsively and irrationally?

12. **Is he vocal?** Does he explain his ideas in such a way that the listener gets the point and agrees with the logic of the case?

Metallurgy has been added to the areas of European technological development studied by Armour Research Foundation of Illinois Institute of Technology. The Foundation has established a service known as the European Technical Observation Group plan which is designed to meet the increasing need for up-to-date information about new developments overseas. The service is being offered to a group of 20 non-competing firms. These companies will receive ideas and techniques of potential value in the American market from a European office set up by ARF.

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FLASH CHANGE® the ultimate in QUICK CHANGE TOOLING

the perfect combination...
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TOOL HOLDERS
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PRECISION TOOLING
Tools Changed in Seconds!
Positive Repositioning of Boring Bars!
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FOR USE ON ALL TYPES OF BORING MACHINES and MILLING MACHINES
DEVLIEG
MICROBORE CO. 2720 West Fourteen Mile Rd., Royal Oak, Mich.

For General Purpose Work and Production Applications . . .

- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
- A complete service is available for engineering and manufacturing special Microbore Flash-Change equipment for all types of production operations.

Write for illustrated Flash-Change Catalog

DEVLIEG MICROBORE® DIVISION OF DEVLIEG MACHINE COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 39

Gardner-Denver . . . Serving the World's Basic Industries

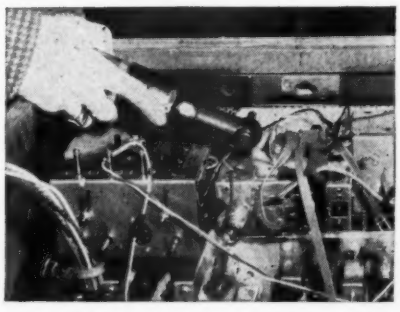
Operator fastens printed circuit assembly to color television chassis—with Keller Tool screw driver.

Keller air tools add the magic touch

Fastenings go into place zip . . . zip . . . zip—when operators use fast-acting Keller Tool screw drivers and nut setters. The pace keeps up throughout the shift—without undue fatigue.

Interchangeable Keller Tool attachments keep up promptly with production line changes. Positive or cushioned clutches. Straight or angle tips. Plus a wide variety of finders, bits and sockets—with magnetic, pneumatic or mechanical pickup and holding devices.

Bulletin 13 gives full information on Keller Tool pneumatic screw drivers and nut setters. Write us today.



Keller Tool right-angle nut setter speeds final assembly of the chassis in color TV cabinet.

GARDNER - DENVER

KELLER TOOL division, Grand Haven, Michigan

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

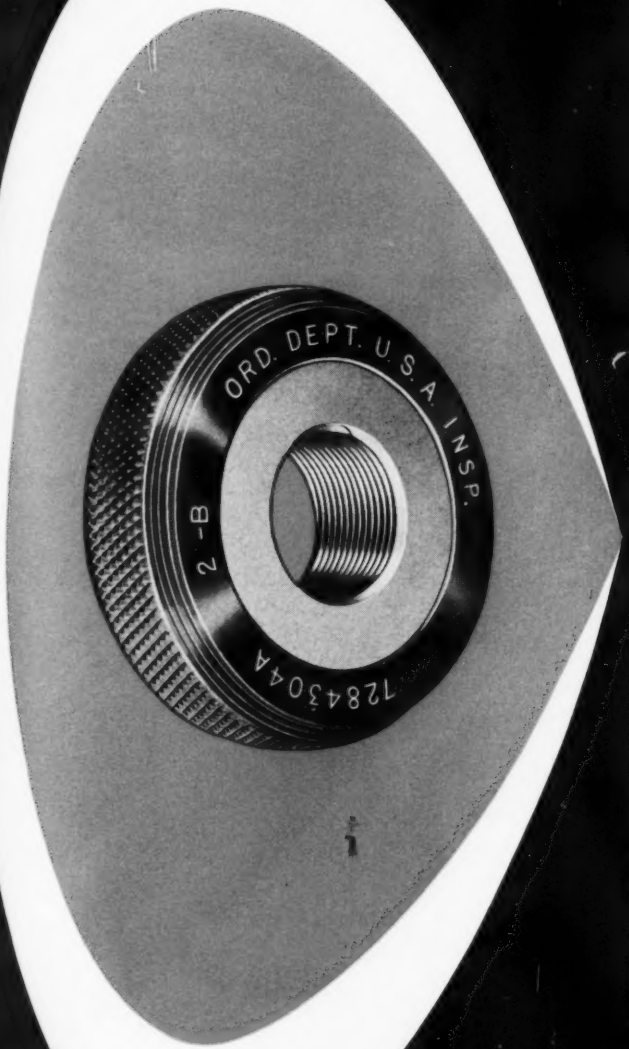
CIRCLE INFORM-A-GRAM KEY NO. 40

Now!

- TROUBLE-FREE
- ACCURACY
- LONG-LIFE
- FASTER GAGING

with

PMCo Ring Gages



With this proven fixed-type Titanium PMCo Carbide Thread Ring Gage you get all the headlined advantages

plus such important benefits as these: use of full product tolerances, no maintenance, assured thread fit after inspection, and ease in handling due to unusually light weight.

Here's why: Pipe Machinery Company's ingenuity and craftsmanship has made it possible to use the round solid design, machine titanium carbide and hold to very close tolerances, achieving standards believed impossible only a decade ago. We know of no other gage that is comparable.

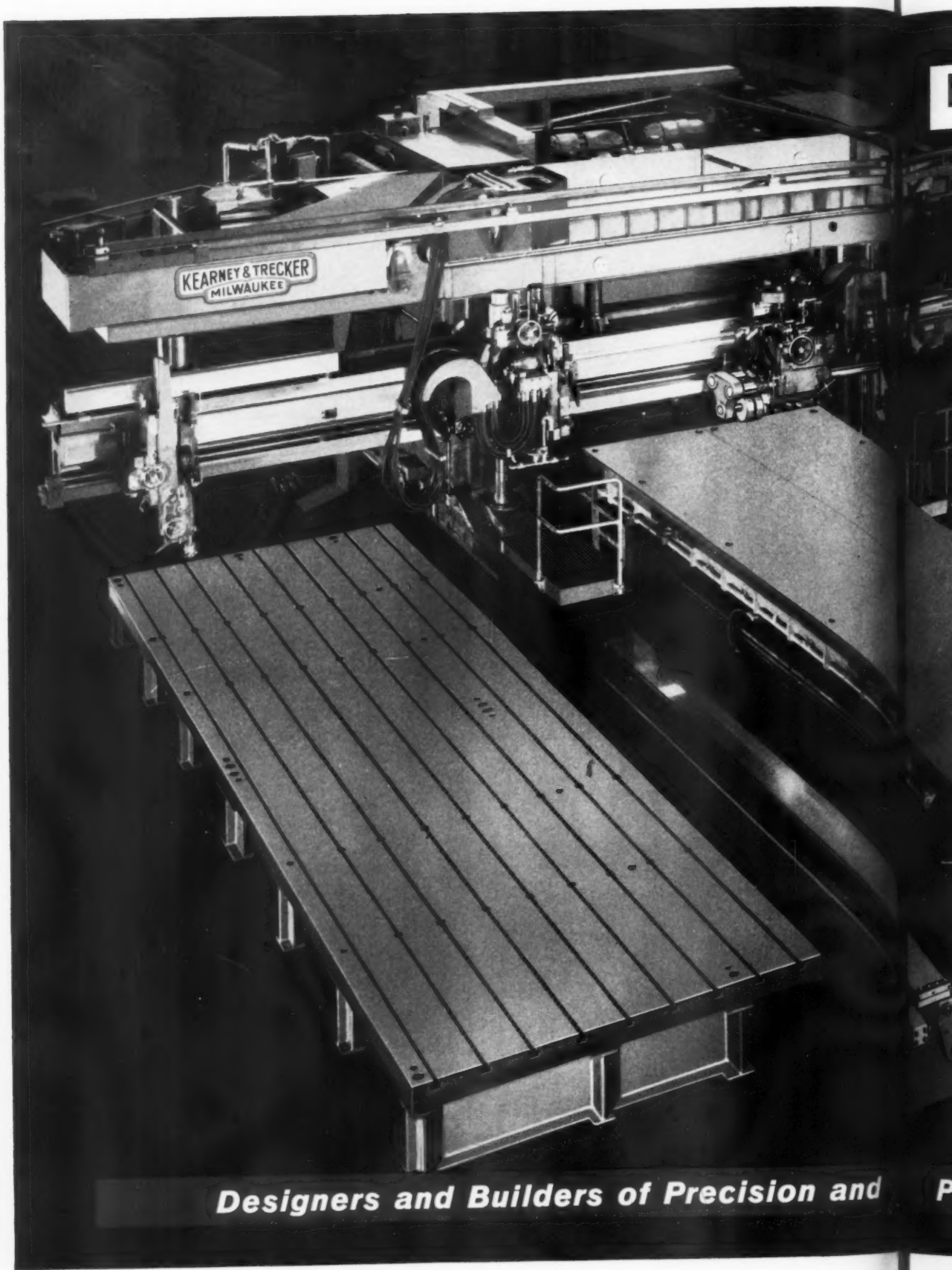
All PMCo Titanium Thread Ring Gages are numbered and registered and the record kept by us for your convenience.

THE PIPE MACHINERY COMPANY
29100 Lakeland Blvd. • Wickliffe, Ohio
Greater Cleveland

● For full details, write for our pamphlet, "Solid Titanium Carbide Thread Ring Gages."

Name_____
Company_____
Title_____
Address_____
City_____ Zone____ State_____

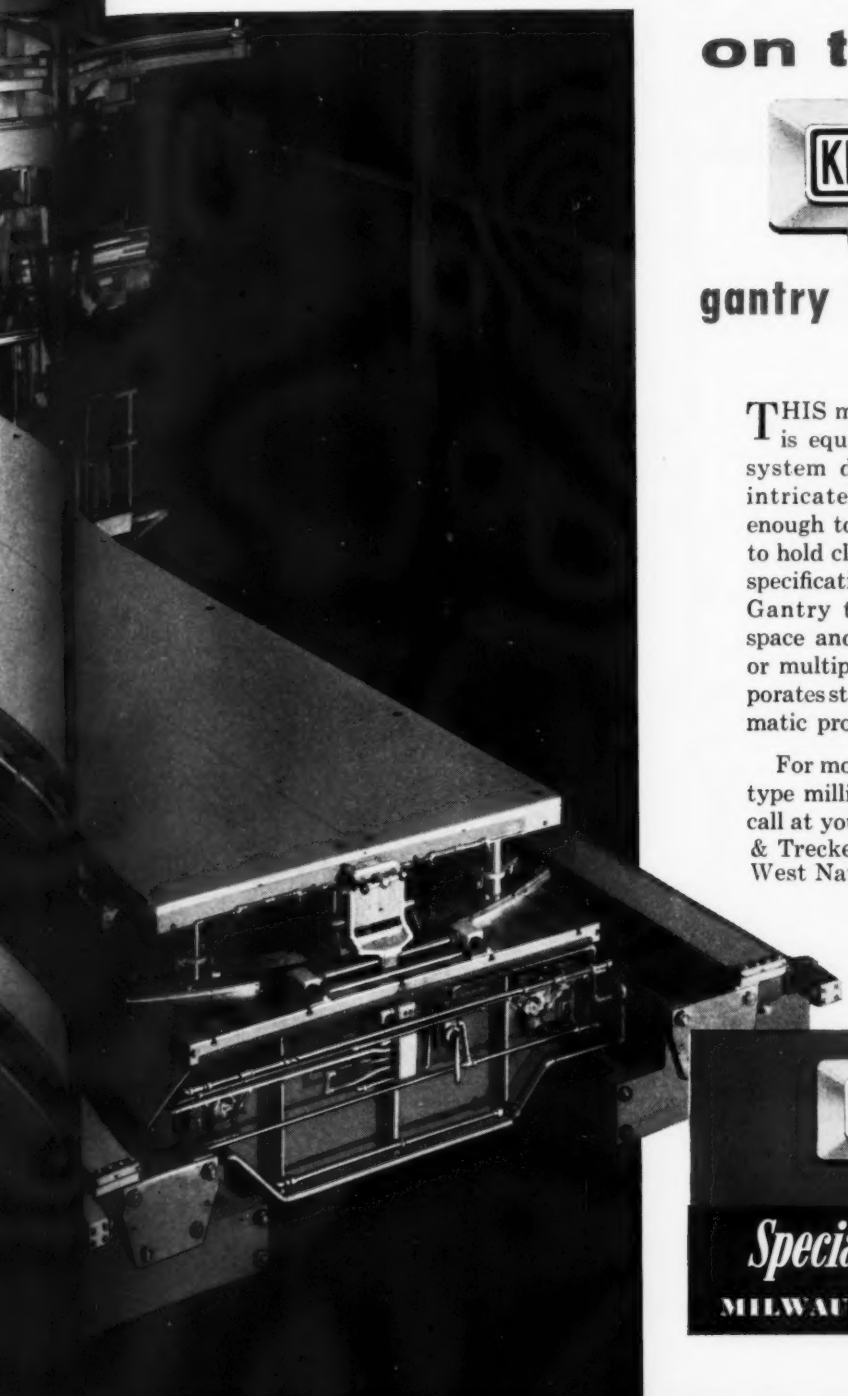
CIRCLE INFORM-A-GRAM KEY NO. 41


KEARNEY & TRECKER
MILWAUKEE
Designers and Builders of Precision and

Picture your workpiece on this 175-ton

KEARNEY & TRECKER MILWAUKEE

gantry type milling machine



THIS massive giant, 42 ft. long, 35 ft. wide, is equipped with electronic tracer control system designed for production milling of intricately contoured workpieces. Rugged enough to mill all metals . . . sensitive enough to hold close tolerances . . . it meets all A. I. A. specifications and has extendable bed design. Gantry type machine takes much less floor space and permits handling larger workpieces or multiple workpiece setups. Machine incorporates standard design components with automatic programming control systems available.

For more specific information on this gantry type milling machine, have our representative call at your convenience . . . or write to Kearney & Trecker, Special Machinery Division, 6776 West National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER MILWAUKEE

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 43

BARNES

Famous for Quality

BARNES

HACK SAW BLADES

POWER BLADES

- **ROCKET**—HIGH SPEED . . . FLEXIBLE . . . Gradient hardness gives this blade a toughness and flexibility unequalled for safe production at low cost.
- **RED ARROW**—18-4-1 . . . ALL HARD . . . Unmatched for heavy duty use. Resists heat generated cutting abrasive materials.
- **SERVICE**—HIGH SPEED . . . ALL HARD . . . For use on low or medium alloy steel . . . an all hard production blade.

ROCKET

RED ARROW

SERVICE

THERE'S A BARNES BLADE FOR EVERY CUTTING PURPOSE

ROCKET

RED ARROW

BARNES TUNGSTEN

3 STANDARD BLADES

- **ROCKET**—FLEXIBLE . . . HIGH SPEED . . . safe . . . tough . . . long wearing for general use.
- **RED ARROW**—HIGH SPEED . . . ALL HARD . . . stays sharp longer on abrasive material.
- **BARNES TUNGSTEN**—HIGH SPEED . . . 18-4-1 . . . for heavy duty use . . . cuts toughest materials . . . tool and die steels.
- **STANDARD FLEXIBLE**—for general purpose cutting.
- **STANDARD "600"**—for thin sections . . . may be used in coarser teeth.
- **SPECIAL UNBREAKABLE**—hard . . . flexible . . . an excellent general purpose blade.

HAND BLADES

Barnes Hack and Band Saw Blades are carried in stock by your Barnes Industrial Distributor. Call him for help on selecting the right blade for your job and for immediate delivery.

when cutting counts BARNES *count on Barnes*

W. O. BARNES CO., INC.

1297 TERMINAL AVE. • DETROIT 14, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 44

People Are Important

by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND DEVELOPMENT CORP.
Cleveland 20, Ohio

OF MIKES AND MEN

NOWHERE ARE TOLERANCES smaller or precision more important than in the metalworking industries. Inaccuracy in the shop is the constant bugaboo of every manufacturing organization.

Precision depends primarily upon two factors: the measuring device, usually a micrometer of some sort, and the man who uses it. The accuracy of micrometers has improved steadily over the years, and a good instrument today can be expected to be accurate within 0.00005".

But what about the men that use micrometers? How much of the painstaking accuracy that is built into the instrument do they lose and how can they be made to make more accurate use of their micrometers?

Not much study has been made in this area but back in 1951, Rupert Evans, a psychologist at the University of Illinois, got interested in the problem and did some research on it. He got himself a set of 10 gage blocks ranging in size from 0.1000" to 0.1009". He put them in a jig which hid their sizes and used them to test the accuracy of micrometer reading by a group of 28 experienced toolmakers and machinists from four different plants. He used a special micrometer designed so that he could see the accuracy of the setting made by the worker. He found that the average error made by experienced tool- and diemakers and machinists was 0.00014". Large errors (0.0003" or more) were likely to be due to misreading the vernier, while small errors could be charged to setting it improperly. He checked his results by having each of the 28 men do the same readings with their personal micrometers and found no difference in accuracy between a familiar and a strange instrument.

He repeated his experiment on a group of 32 toolmaker and machinist apprentices. In this group it was found that it did not matter whether measurements were made with the

Dr. Erwin K. Taylor, whose column will be a monthly feature in this publication, is an "industrial psychologist". For a thorough definition of the term, write to The Editors, TOOLING & PRODUCTION, 1975 Lee Rd., Cleveland 18.

. . . *Continued on Page 48*

Bodine CASE HISTORY NO. 42

HEADLIGHT ADJUSTING SCREW ASSEMBLY SPOTLIGHTS VERSATILITY OF BODINE METHODS

This is but one of many ways in which versatile, time-tested Bodine basic machines and units can be teamed to create high-speed, cost-cutting assembly units without resort to costly "specials."

Note especially the ease and convenience with which auxiliary equipment (in this case automatic hopper feeds) can be grouped around the Bodine "chassis." Note also the high production and close limits maintained on this day-in, day-out production line job for one of the world's largest automobile manufacturers.

PRODUCTION: 3,000 completed assemblies per 50-minute hour. Machine speed, 30 strokes per minute.

1

Unthreaded molded nylon nut hopper-fed and transferred to the dial fixture . . . 2 pieces per stroke.

2

Adjusting screws hopper-fed, transferred and driven into nylon nut . . 2 pieces per stroke.

3

Auto eject completed assembly. Depth of screw driving held consistently within ½ turn in untapped nut.

Write Dept. TP-7.

If high-speed, low-cost assembly is one of your problems . . . in metals, plastics, or a combination of both . . . with or without concurrent machine operations . . . check first with Bodine. The possibilities of our methods are practically unlimited.

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

BBDSS

CIRCLE INFORM-A-GRAM KEY NO. 45

CIRCLE INFORM-A-GRAM KEY NO. 44

MANUFACTURING MEMOS

Revised Nickel Expansion Goal . . .

● This revised expansion goal for nickel is aimed at providing a U.S. annual supply of 440 million lbs of the metal by 1961. The goal includes both imported and domestically produced nickel. At the new level, the available nickel supply would be 140 million lbs above the present annual supply and 60 million lbs over the previous 380-million-lb goal. The announcement of the revised goal was made by Director of Defense Mobilization Arthur S. Flemming.

Receives Award . . .

● A. F. Sprankle, metallurgical engineer for The Timken Roller Bearing Co., received the 1955 Regional Technical Meeting Award from the American Iron and Steel Institute. He was cited for his paper, "The Effect of Deoxidation Practice and Hot Work Reduction in the Occurrence of Magnaflux Applications in E4340 Steel."

Forms New Division . . .

● Michigan Tool Co. has formed the Gear-O-Mation Division to design and build automation equipment for high-volume manufacture of gears and other small parts of similar size and contour. The new division will be a single, central source for the manufacture of complete automated gear production systems.

● In May, True-Trace Corp. of El Monte, Calif., held a Use and Care Clinic to aid employees of the company's customers. The clinic which was made up of a series of one-day programs of demonstrations under power of True-Trace tracers, was arranged by Roy Rosebrook, chief engineer. In addition, the firm sent out questionnaires to find out what the employees wanted to know.

● Vulcan Crucible Steel Division, H. K. Porter Co., Inc., is the exclusive producer and seller of tool steels within the Porter organization. Tool steel operations were transferred from the Henry Disston Division. Vulcan tool steel will be distributed in eastern Pennsylvania, southern New Jersey, and Delaware by Steel Distributors, Inc.

● Formation of a new subsidiary, Briney Mfg., Co., has been announced by Goddard & Goddard Co. The new subsidiary specializes in the manufacture of boring heads. The Briney line of "Size Positive" boring heads will supplement the line of Go & Go milling cutters and other tools.

The Cleveland Cap Screw Co. has leased its Plant No. 2 on E. 79th St. in Cleveland, to the Euclid Division of General Motors Corp. Cleveland Cap's hot-heading department which produces giant-sized cap screws for industry, was moved from this plant to a finished area in a new one under construction in southeast Cleveland. The Euclid GM division is using the building primarily for service parts for earth-moving equipment.

◆

Baird Associates, Inc. and Atomic Instrument Co., both of Cambridge, Mass., have merged. The new company is known as Baird Associates-Atomic Instrument Co. The Baird firm manufactures optical-electronic equipment and Atomic Instrument makes instruments and components for the electronic and nuclear fields.

◆

The assets of Allen Mfg. Co. were acquired by Chicago Pneumatic Tool Co., according to an announcement by James G. Osmond, president of Allen. Allen which became a wholly-owned subsidiary of Chicago Pneumatic, manufactures Allen Head set screws and cap screws, and other hex-socket products. The new subsidiary will retain the same name and present personnel.

◆

Amelco, Inc., Santa Monica electronic firm, has purchased all products and inventories formerly manufactured and sold by Goodreau Engineering Co. The announcement was made by Remy Hudson, Amelco president. Goodreau's principal product is the Acra-Stop device that makes it possible to set up an engine lathe with as many as 80 precision stops in a 10" run.

◆

The management performance of Cincinnati Milling Machine Co. has been termed outstanding by the American Institute of Management in its 1956 Manual of Excellent Managements. Cincinnati Milling was singled out from among 409 companies listed. The company is cited for a noteworthy record in production, through both prudent employment of physical facilities and healthy employee relations.

◆

C.I.T. Corp., the nation's largest industrial financing firm, has opened a Dallas division to handle growing demands for machinery and equipment financing in the Southwest. J. A. Turriff was named to head the new division.

Announcing the NEW WELDON CATALOG NO. 11

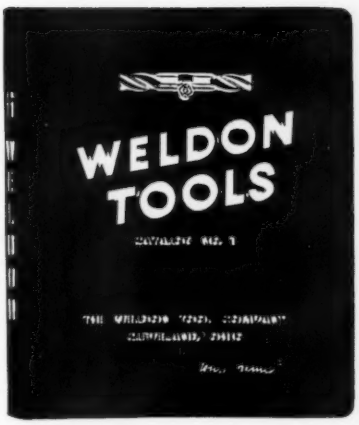
Size 8½" x 11"

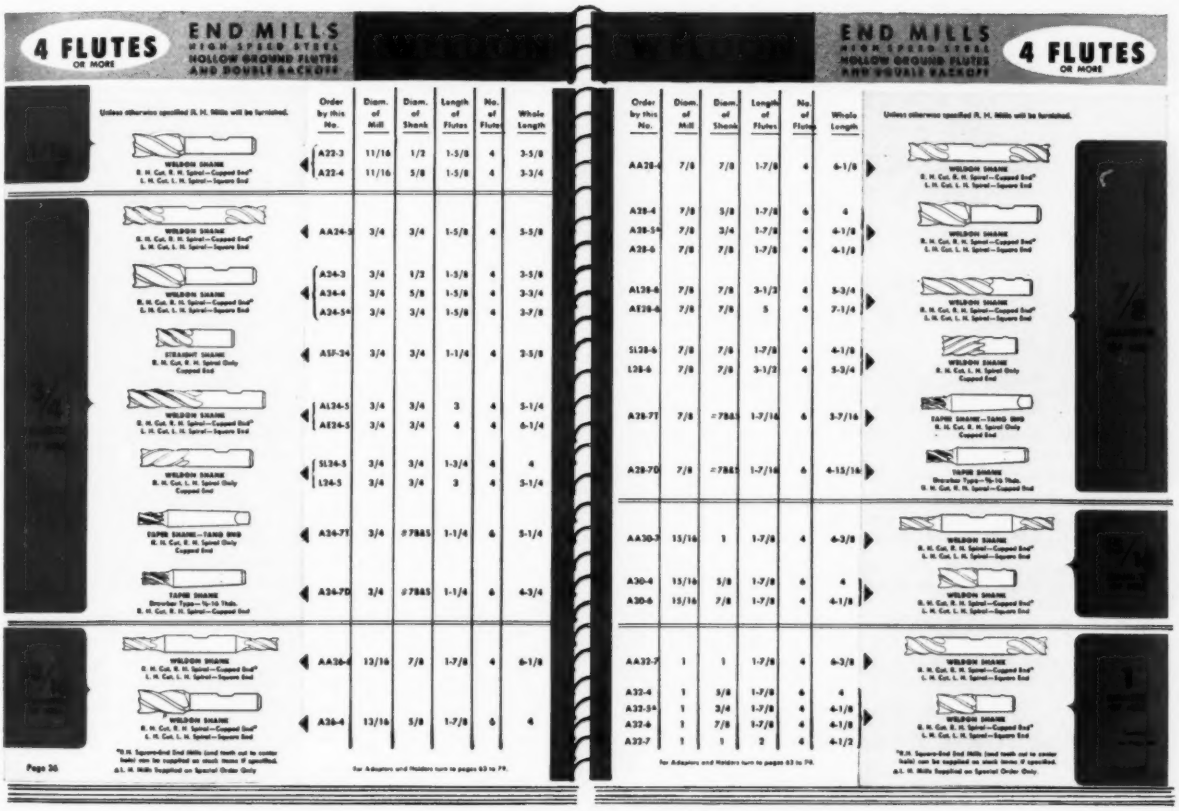
A Unique Improved Idea In A Tool Catalog That Makes Selecting Tools Simple, Easy and Confusion-Free . . .

Contains a Complete Listing of

WELDON END MILLS
END MILL HOLDERS
TU-LIP COUNTERBORES
NEW TYPE COUNTERSINKS and DEBURRING TOOLS
ANGULAR CUTTERS
SHARPENING FIXTURES
HIGH SPEED STEEL and CARBIDE FORM TOOLS

✲ You can PERSONALIZE your catalog with your name in gold (Foil furnished).





A unique new idea in a tool catalog is presented by the Weldon Tool Company, the oldest and largest producer of modern type End Mills, End Mill Holders and Allied Products. The distinct feature of Catalog No. 11 is the progressive listing of tools by sizes, complete with detailed dimensions—an arrangement that will be instantly recognized as a helpful, easy and simple aid in selecting tools with a minimum of confusion.

If you have not already received Catalog No. 11, please contact your Weldon Distributor. If you prefer, write us for a copy, sending your name and company address.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

YESTERDAY'S PIONEER —TODAY'S LEADER

CIRCLE INFORM-A-GRAM KEY NO. 47

Now! Closer gage block tolerances give you up to 75% longer wear life at no increase in price!

Ellstrom Standards are now produced and unconditionally guaranteed to specified millionths well within the following improved gage block tolerances:

"W" Working Accuracy Blocks: +.000008", −.000002" per inch of length, with flatness and parallelism held within .000006".

"I" Inspection Accuracy Blocks: +.000004", −.000002" per inch of length, with flatness and parallelism held within .000004".

In addition to providing finer accuracy at no increase in price, these Ellstrom Standards also give you up to 75% longer wear life. For, by reducing the allowable "minus" deviation, you get an additional guaranteed wear allowance of from 2 to 6 millionths of an inch, as compared to common industry standards, before the blocks need be considered worn undersize.

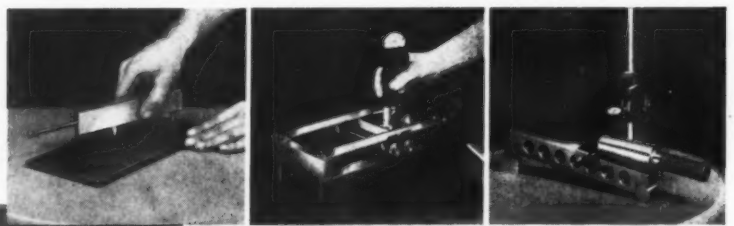
Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000" to meet your particular needs. Send for complete specifications and prices today!

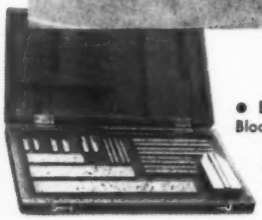
Set No. 35-R: "W"—$195.00; "I"—$280.50

Set No. 81-SA: "W"—$545.00; "I"—$764.35

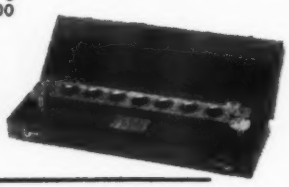
ELLSTROM STANDARDS DIVISION
DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA





- Ellstrom Internal Setting Gage—12" range: $185.00
- Ellstrom Rectangular Gage Block Accessory Set: $288.95
- Ellstrom Master Sine Bar "W" Accuracy: $112.50 "I" Accuracy: $152.75



CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Of Mikes & Men, from Page 44

gage block in the fixture or held in the hand. Furthermore, apprentices did just as well as did journeyman toolmakers and machinists. Also, there was no relationship between accuracy of micrometer reading and such factors as age or experience.

Since there were 10 gage blocks graduated in steps of 0.0001", there should have been an equal number of readings ending with digits 1, 2, 3, 4, etc. As has been found in many other dial reading experiments, there was a marked tendency toward "rounding off". Many more readings ended in zero than should have been the case, while readings that should have ended in "three", "six", and "nine" appeared much less often than should have been the case.

The final step in the experiment was to give a brief training course in micrometer reading to a group of five men with no previous experience. They were, on the average, about as bright as the toolmakers previously used. The training consisted of 30 minutes of instruction on how to use a micrometer to measure the gage blocks. The students were told to measure the gage blocks and then compare their readings with the markings on the blocks. After 30 minutes of this they were tested by having them read the blocks with the size concealed. When they had finished, the correct readings were given to them and they marked them down beside their own readings for comparison. By the end of 10 lessons, the average error for the five students was 0.00003" as compared with an average error for the machinists and toolmakers of 0.00015". But when the trainees were retested after a lapse of 10 days with no practice, their average error jumped to almost 0.00018".

This may provide a valuable clue for shops that are not getting the kind of accuracy that they want. A half-hour a week in accuracy maintenance retraining could save many times its cost in reduced rework time and material spoilage.

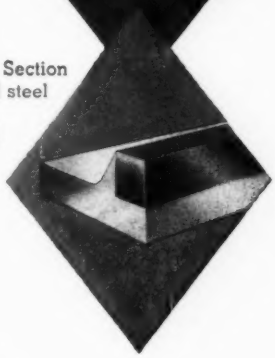
TALBOT OHIO P-R MAN FOR CHRYSLER

Douglas Talbot has been appointed as Chrysler Corporation's Ohio public relations representative, according to an announcement by James Cope, the company's vice president in charge of public relations.

A native Ohioan and graduate of Ohio State University, Talbot's most recent assignment was as assistant manager of community relations at Chrysler's headquarters in Detroit. Before that he was with Chrysler Corporation's Airtemp Division in Dayton, Ohio.

Photograph courtesy of the Ready Machine Tool & Die Company, Inc., Connersville, Ind. shows Ohio Knife Co. Composite Die Sections on a blank and pierce die for a 4' x 6' refrigerator inner food compartment.

there's a NEW way to build your dies



OK Die Section shows tool steel clad to mild steel backing.

it saves you time and money

You simply order from our large stock of Composite Die Sections. They are cut to your required length or in bars 125" long. There are eleven standard cross sections with both wide and narrow lands available.

You buy them at a price far below what it's costing you to make them yourself.

You receive them with cutting or forming edge already hardened, machined and ground. The soft steel backing, to which our specially hardened tool steel is clad, can be drilled quickly and economically for dowel and screw holes. Adjustments for wear are equally simple.

Hundreds of companies who have switched to OK Composite Die Sections available for Cutting, Trimming and Forming Dies, report great time and money savings, plus longer die life. For new bulletin on OK Composite Die Sections and Clad Aluminum Bronze Wear Plates, write Dept. 47-LL.

Manufacturers
for the Metal Working Industry of:

Composite Die Sections . Bronze Ways . Wear Strips
Shear Blades . Slitter Knives . Work-Rest Blades
Cut-off Blades . Hardened Ways . Hardened Spacers

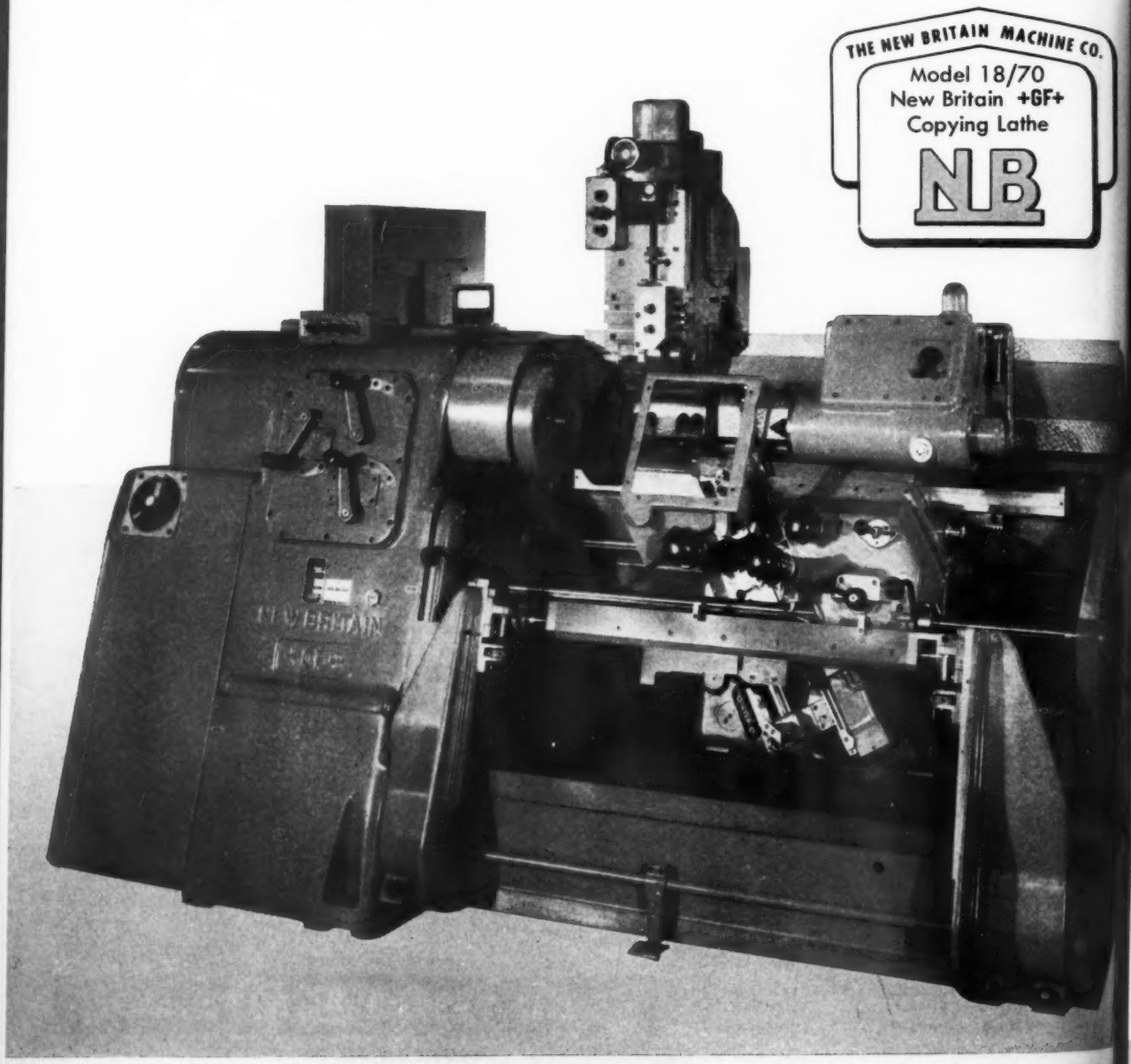
THE OHIO KNIFE CO.

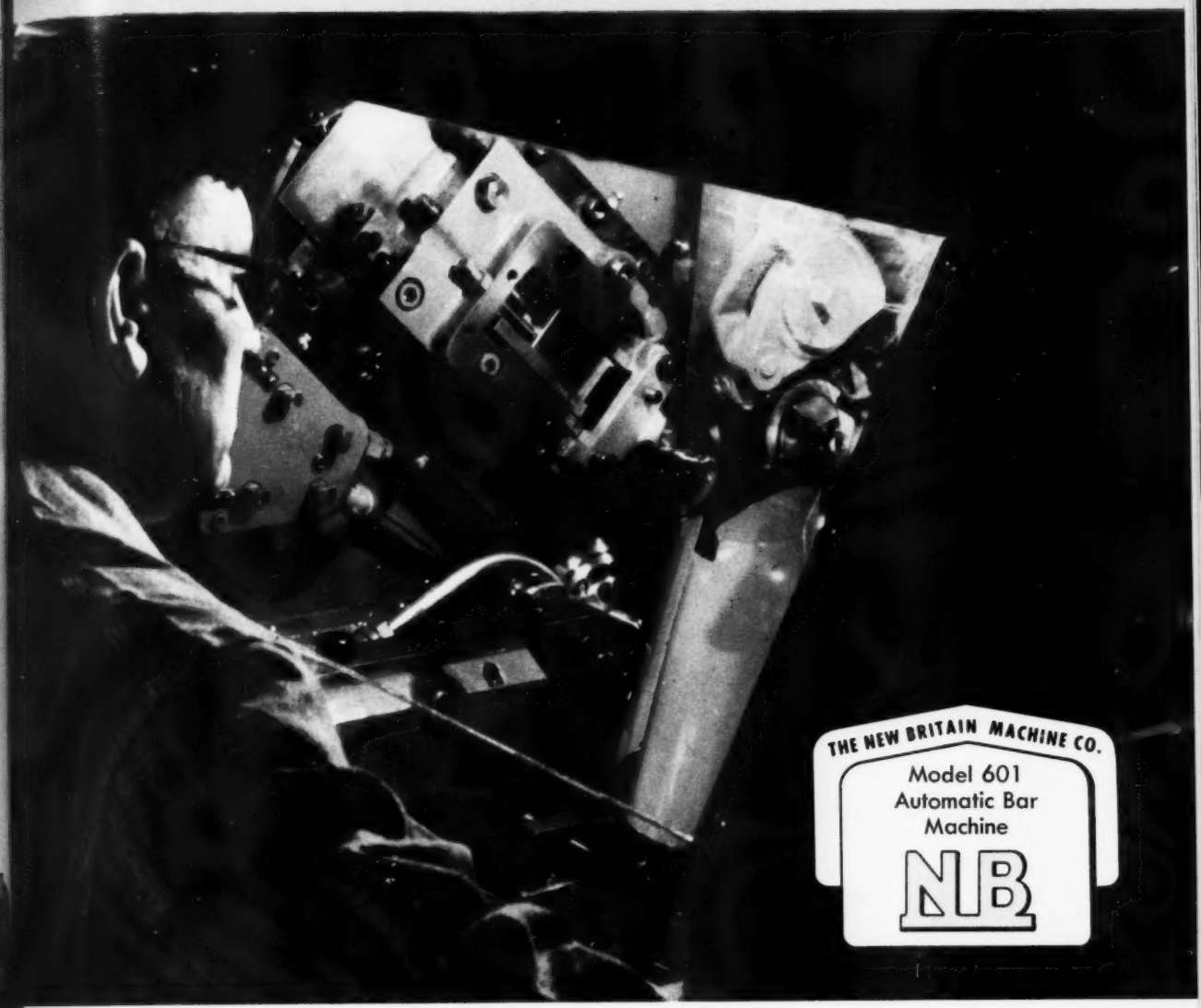
CINCINNATI 23, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 49

investigate a brand new approach to turning

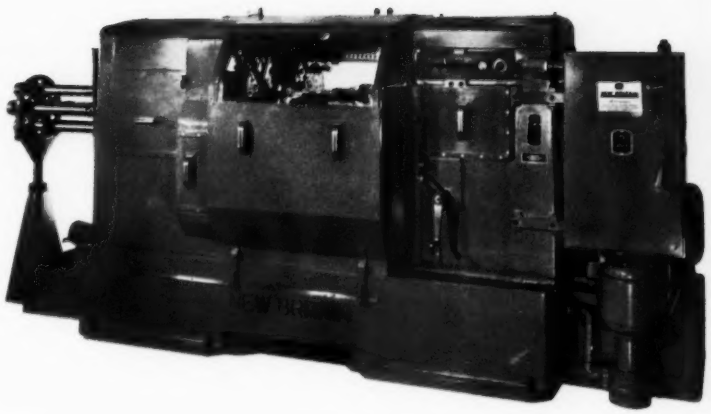
On this New Britain **+GF+** Copying Lathe, you can make an accurate first piece from a blueprint—then *copy* it accurately a million times if your requirements call for it. New Britain can supply automatic loading too, if it makes sense on your work. Let us give you the complete story of this new contour approach to turning in a color motion picture demonstration in your office. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

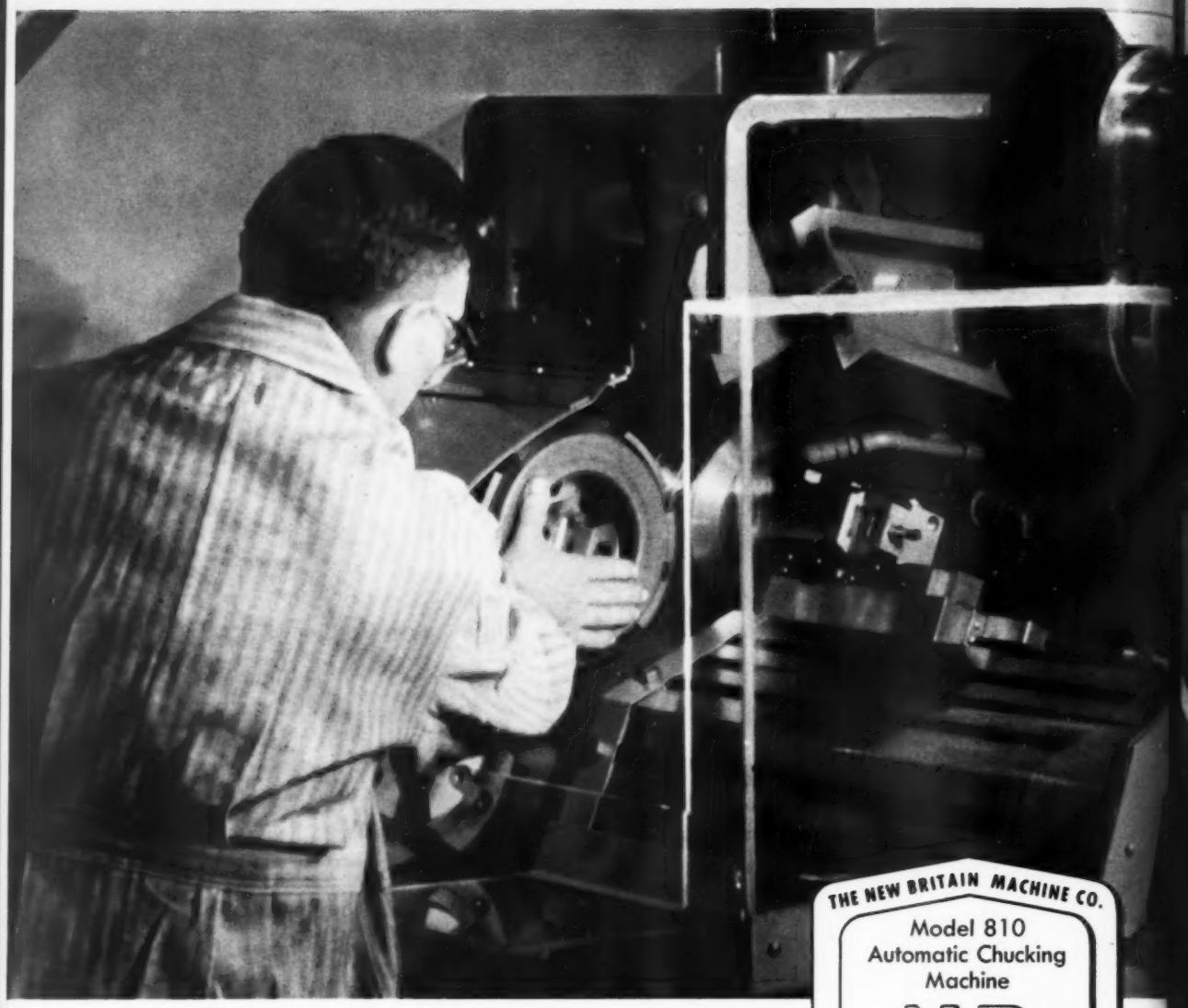




8 tons of metalworking efficiency

If you are interested in absolute minimum cost per piece on either long or short runs, investigate the Model 601 New Britain bar machine. Massive enough and powerful enough to handle your new high-speed cutting requirements. Super-high spindle speeds, maximum versatility, optional universal tool slide cam which eliminates cam change time. With the Model 601 on your floor you have "the shortest distance" between bar stock and finished piece. Write for Bulletin 6H.



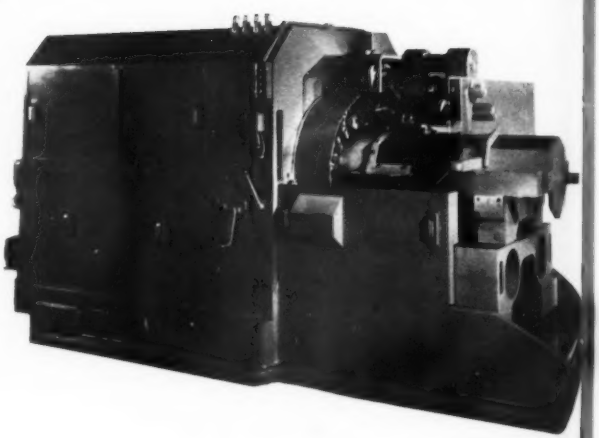


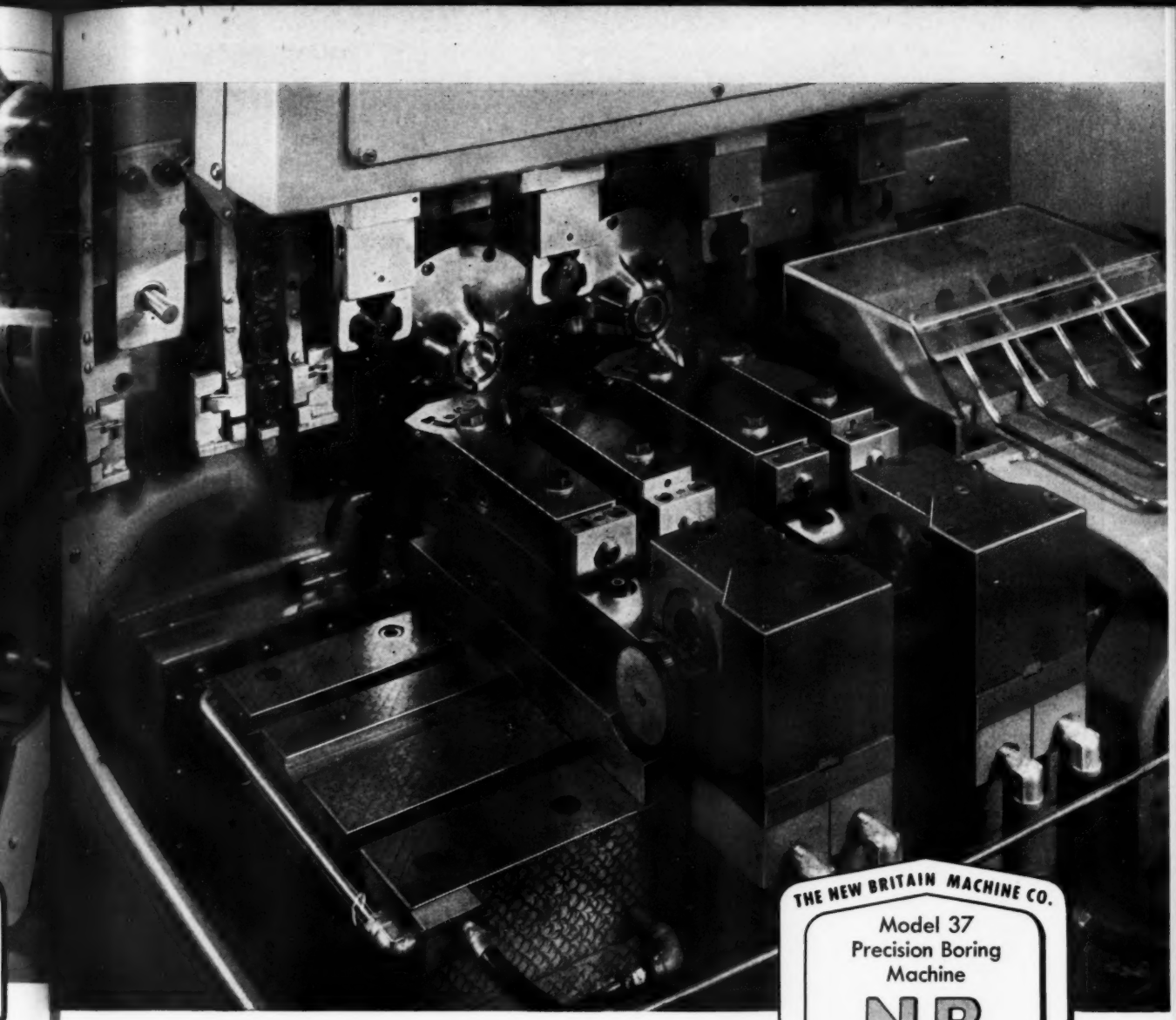
new New Britain chuckers handle bigger work pieces

If you know chucking machines you know the world-wide reputation of New Britains for accessibility, versatility, quick setup and sustained high production of precision parts.

Now new New Britain models enable you to apply this high productivity to pieces with chucking diameters up to ten inches on eight-spindle machines, twelve inches on six-spindle production and fifteen inches on four-spindle work.

Check this practical approach to more profitable production with your New Britain representative, or write for Bulletin 3R. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



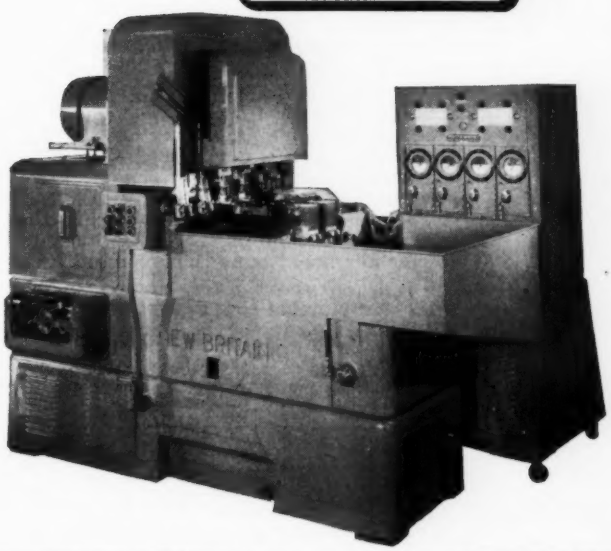


here's fully automatic precision turning and boring

This Model 37 New Britain is a down-to-earth money-making application of automated machining—made practical by automatic loading, *plus* high-spindle speeds, *plus* multiple-spindle production, *plus* automatic gauging, *plus* automatic close adjustment of each tool.

These modern machines, with or without automatic controls, will enable you to make simple work of tough jobs involving such operations as step turning, step boring, boring and facing, turning and facing, grooving, recessing, chamfering or generating contours.

Available in a complete line of horizontal, vertical and double-end models.



NEW

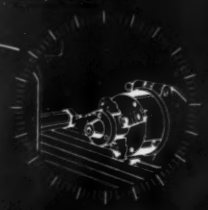
ERICKSON

MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

straddle milling



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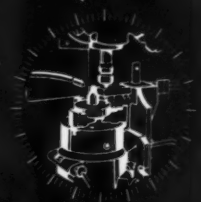

jig drilling
with either micrometer or "Jo" block setting

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CIRCLE INFORM-A-GRAM KEY NO. 54

editorial:

Operations Cost-Cutting

AS PRODUCTIVITY PER MAN, machine, or unit of time is increased, manufacturing costs decline. This end result is absolutely essential in today's highly competitive economy; competition for customer acceptance; competition in product quality and performance; and competition for a sustaining profit.

Manufacturing cost control may be effected in many ways — ranging from the most spectacular automation setups to some often overlooked considerations of workpiece design and processing.

After all is said and done, the most extensive, intricate, and costly automated lines can be broken down into individual operations such as milling, drilling, grinding, and other basic chip-making procedures.

Many of these standard, elementary operations can be explored for cost-cutting potential. Of course, a classic example of cost-cutting in a chip-making operation is that of imparting a finely milled finish to a surface that fits against nothing but air. Here, the cost of the machining operation can be reduced 100% by eliminating it.

In almost the same category come the specifying of unreasonably close tolerances which contribute nothing to the fit or performance of the mating parts. This applies both to dimensional values and surface finish.

Yardsticks for measuring the effectiveness of the steps that may be taken in the attainment of cost reduction in chip-making operations are hard to come by. Rule-of-thumb procedures can be established by experience, and a generous mixture of common sense is essential.

Toward reducing some of these factors to the realm of tangible standards and measurements, great progress has been reported recently by Lad J. Bayer, Chief Industrial Engineer of The Warner & Swasey Company. His findings were presented at last month's semi-annual meeting of the American Society of Mechanical Engineers, Production Engineering Division.

Although his research was confined to the conditions and cost-behavior patterns of the one plant under study, the principles of cost-cutting which he discloses in his paper are applicable to any manufacturing enterprise.

He found, relative to the most common of all metalworking operations, i.e., hole drilling, that increasing the length/diameter ratio of a hole from 2:1 to 5:1 increased the cost of drilling the hole by 400%. With true deep hole drilling, a hole of 10:1 length/diameter ratio shows a cost increase of 1500%!

Surely, this presents a tremendous incentive to parts designers to explore all possible ways and means of keeping all hole length/diameter ratios to a minimum compatible with functional requirements.

Mr. Bayer's investigations in the realm of lathe turning cuts of varying surface roughness in microinches were equally significant in outstanding cost comparisons.

Starting with a turned surface roughness value of 400 rms, a specification of 125 rms ran the cost up 150%; 63 rms exacted a penalty of a 500% increase in cost of attainment; while a surface turned to a roughness value of 25 rms shot up to 900% in cost increase.

Mr. Bayer also demonstrated how varying dimensional tolerances affected costs of face milling cuts and cylindrically ground surfaces of varying surface roughnesses.

In the instance of a face milling cut of 63 rms surface measure and a tolerance of over 0.002, tightening the tolerance to 0.002 and under increased the cutting cost by some 110%. In cylindrical grinding, where a tolerance of 0.0005 was being held, narrowing the surface roughness specification from 40 rms to 25 rms increased the grinding cost by nearly 50%.

It is our opinion that Mr. Bayer's extensive research in this area of cost-cutting vs fineness of degree of metal removal is a major contribution to the art of metalworking. His findings should serve as a great incentive for any manufacturing organization to review its methods and concepts of parts design and processing.

There are profits in cost-cutting. They have to be dug out. Lad J. Bayer has performed some invaluable spade work.

E. Willard Pennington

July, 1956 editor

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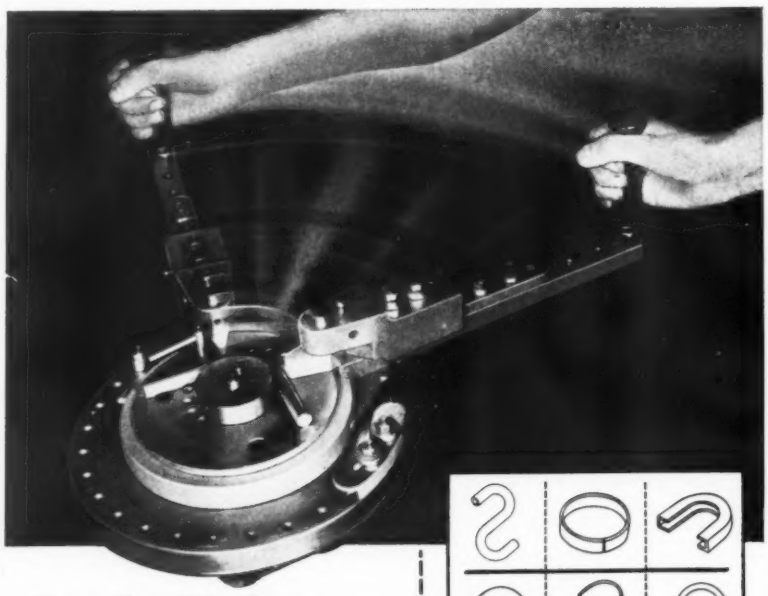

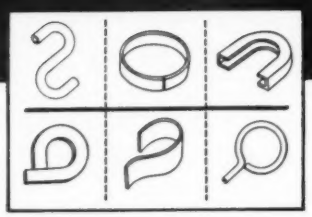

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CIRCLE INFORM-A-GRAM KEY NO. 57

PLASTICS CUT COST AND WEIGHT OF PROTOTYPE TOOLING

by George Hays
Superintendent, Sheet Metal Division
and John Crichton
Superintendent, Plastic Tool Division
CREATIVE INDUSTRIES
Detroit, Michigan

PLASTIC TOOLING has proved itself in the metal forming industry. In many applications where conventional tools of metal and wood were formerly used, plastic tools are now widely accepted as providing a faster and more economical means toward obtaining results that are at least equally efficient.

One sphere in which plastic tooling has demonstrated its advantages to a particularly marked degree is in the prototype production programs of automotive companies, with savings in many thousands of dollars cited in just single phases of such programs by leading automobile manufacturers. The particular assets of plastic tools which lend themselves best to prototype programs are the simplicity of their equipment requirements and their ready reclaimability.

In fields such as the automotive industry where design changes must be made and tested frequently, there is no question of the fact that this reclaimability characteristic enormously enhances the desirability of plastic tools. Where it requires considerable time and expense to make successive metal tools for successive revision of models, plastic tools for prototype and relatively short runs can be quickly and inexpensively altered. Design changes can be incorporated by simply chipping away a section of the tool and recasting it. A tool can be completely made over by suspending it in a mold and recasting its face.

As resin suppliers have continually collaborated with metal formers to develop resins particularly adaptable to specific needs — such as those with special properties like abrasion resistance—the types of prevalently used plastic tools have expanded. They have included hydroform blocks, stretch plugs, draw dies, and others — particularly for short-run and developmental work.

At Creative Industries, we have proved these advantages in successful applications. Because of its speed and economy, the Creative Industries sheet metal department is using plastic tooling very satisfactorily — with plastic materials employed for hand hammer forms to shape such metal parts for automobiles as fenders, dash panels, and inside door panels.

An additional important consideration which we feel commends the use of plastic hammer forms is their light weight. Often, two men can easily lift and carry a plastic tool while a metal tool of the same size would require power lifting equipment.

The light weight advantage can be comparatively illustrated. Hammer forms have been made by Creative using the epoxy resin No. 616, recently developed by the Marblette Corporation, which cures at room temperature. This material weighs 110 lbs/cu ft, about one-fifth the weight of zinc alloy. On large forms, the weight of the tool is further greatly re-

Fig. 1. Lacquer is sprayed as a sealant over the plaster mold which has been taken from a male master model and then dried. The plaster's surfaces are subsequently waxed and buffed smooth, and a parting agent is applied.

duced by using a core of Marblette phenolic foam resin No. 1076, with a density of 14 lbs/cu ft.

A step-by-step recapitulation of the methods used by Creative (and in similar manner by other metal forming shops) demonstrates the speed and simplicity of the procedure for fabricating plastic hammer forms.

The process normally starts with a male master model from which a plaster female is taken. For this, Hydrocal B-11 is used as the face, and sisal hemp impregnated with Hydrocal B-11 as a backing. For exceptionally large forms, a plaster and hemp combination about 2" to 2½" thick is frequently used, with a tie running to a greased metal framework. The plaster is force-dried overnight in an oven at 135° F. Often the drying procedure can be accomplished by pouring carbon tetrachloride generously over the plaster surface. This cuts the drying time down to about 20 minutes because the plaster dries on evaporation of the carbon tetrachloride and immediate sealing becomes possible.

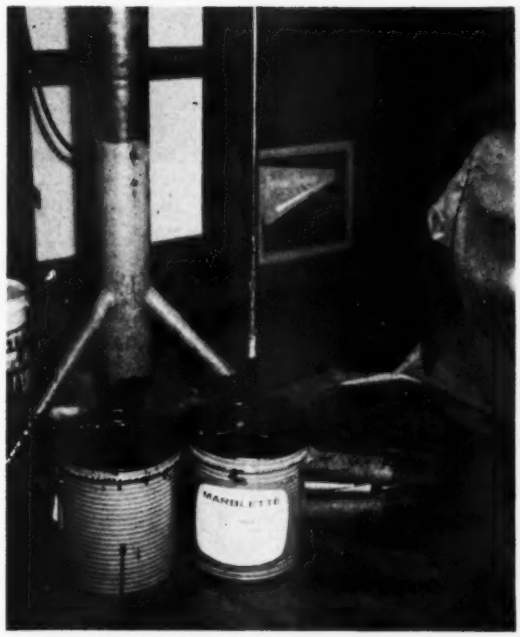


Fig. 2. Manual mixing or the employment of simple standard electrical mixers — such as this "Lightnin" mixer — is all that is required for thorough blending of the liquid epoxy resin and hardener prior to pouring the mixture into the mold for casting.

The dry plaster mold is sealed by spraying on a lacquer, Figure 1. After the lacquer has dried, the surfaces of the mold are waxed with a paste wax and buffed smooth. Then a parting agent, such as Vibrin VPA, is sprayed on to facilitate easy removal of the plastic part that will be formed in the mold.

If it is not necessary to lighten the tool with a lighter weight, lower cost core, the liquid resin casting mixture — in this instance Marblette epoxy resin No. 616 and a specially formulated hardener — is poured directly over the plaster mold. As shown in Figure 2, the thorough mixing of resin and accelerator that is indicated requires no special equipment. It can be done with a "Lightnin" mixer as shown here, or by other types of electrical mixers, or in some cases even manually.

When a foam core is employed, a block is cast **beforehand** for this purpose. In a contain-

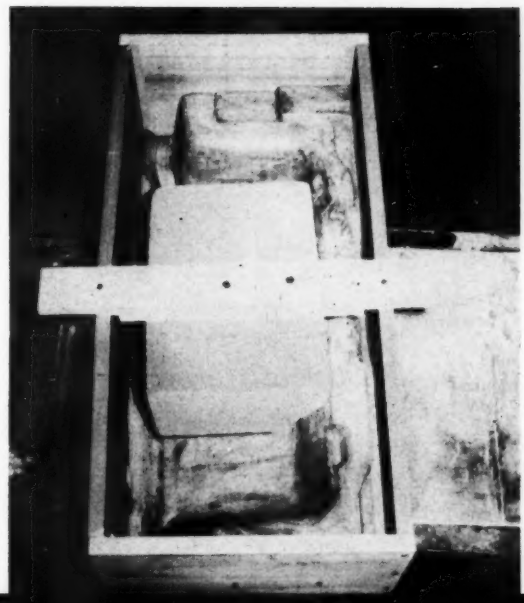


Fig. 3. A core cast by mixing and curing Marblette phenolic foam resin, hardener, and foam powder is set into the plaster mold's cavity and firmly secured to prevent flotation.

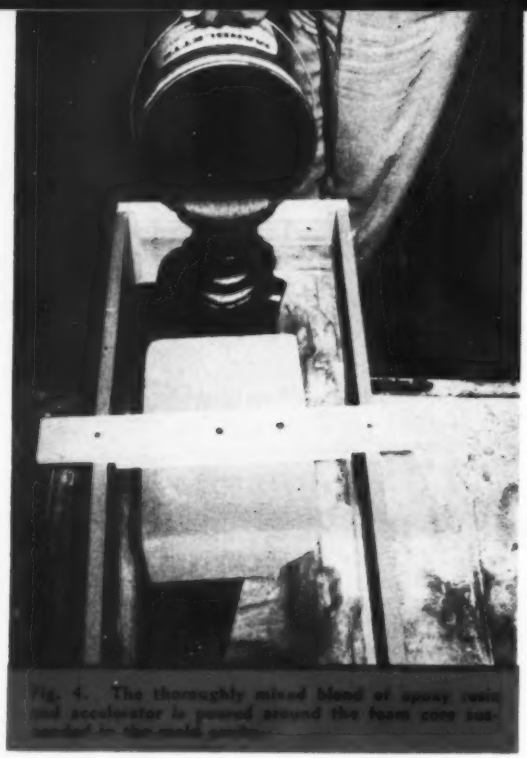


Fig. 4. The thoroughly mixed blend of epoxy resin and accelerator is poured around the foam core suspended in plaster mold's cavity.

er deep enough to allow for the foam to rise about double its starting height, Marblette phenolic foam resin No. 1076 and hardener are mixed mechanically at high speed, and then foam powder No. 1101 is slowly added. This mixture is poured into a waxed box that has first been treated with a sealant. The box is placed in a baking oven, where the foam mixture will cure overnight at 140° or in two hours at 250° F. After removal from the box, the hardened foam block is trimmed and shaped with a band saw or hand tools to fit within 1½" to 3" of the plaster mold's surface. This provides room for pouring the casting resin around it to provide the plastic tool's face.

Suspended in the plaster mold's cavity, Figure 3, the foam block is securely fastened by a board nailed or tied down across the frame.

The epoxy resin is then poured into the cavity around the suspended core as shown in Figure 4.

Whether used as the entire body of the plastic tool or as a face over the type of "prefabricated" phenolic foam core, the epoxy will set overnight at room temperature, i.e., between 70° and 85° F. The next morning, the frame is removed, Figure 5, and the plastic tool is easily separated from the plaster mold, Figure 6.

It is found that shrinkage is practically nonexistent in using these materials. This means that "barbering" such as would be required for a metal tool is completely eliminated in producing a finished epoxy hammer form, Figure 7, ready for operation.

Certain variations of this procedure have been found useful both by Creative and other metal forming shops. One is to use dry foundry slag to lighten tools and lower their costs, as an alternative to employing a foamed core. In this case, the epoxy No. 616 and hardener mixture is filled two-thirds of the way in the plaster mold and then the slag is mixed in.

Another diversification of the basic method takes place in instances where there is a requirement for tools with sharply contoured edges, or when it is necessary to produce quite a few panels from the hammer forms. Under these circumstances, a stronger form is made by casting resin No. 616 into a laminate built up an eighth of an inch with Marblette epoxy laminating resin No. 602 and epoxy gel coat resin No. 613. The resulting laminate face will stand up to considerable stringent wear.

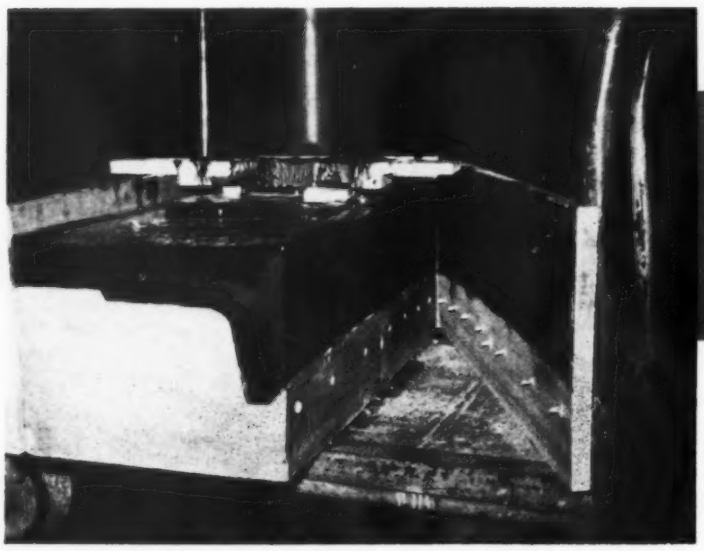


Fig. 5. After an overnight cure, the epoxy tool cast over the plaster mold has completely hardened. This next step is removal of the frame containing the tool and mold.

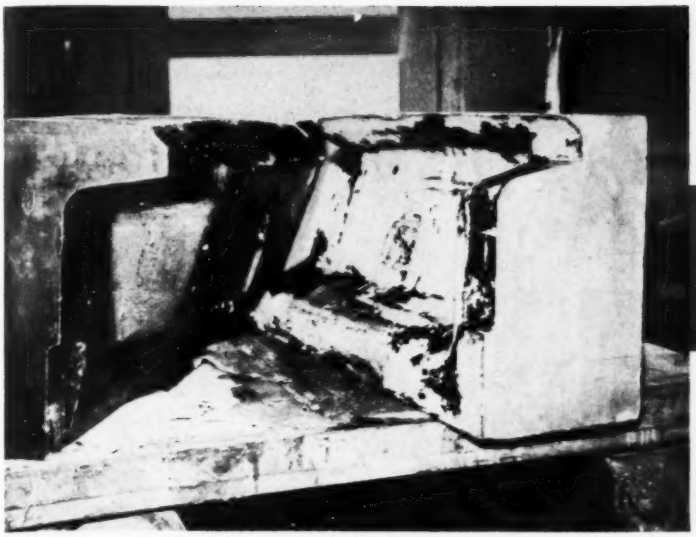


Fig. 6. Since the plaster mold had previously been waxed and covered by a parting agent, it is a simple matter to separate it from the epoxy hammer form.

A further method of providing for exceptionally sharp contours is the use of precision-cast inserts of brass or zinc alloy. These are set in the mold prior to casting the core resin, and are mechanically locked into place by slots or bolt heads protruding into the plastic.

Still another method in use is the casting of a tough plastic face over a metal or plastic core.

An important advantage that has been frequently stressed for plastic tooling applications is materials cost saving. This is obviously true, and can be developed to its ultimate by firms whose personnel become more and more acquainted with plastic tools, as in the case of one of the automobile manufacturers whose sheet metal department has been successful in forming metal parts from tools cast from phenolic resin, a material with substantial attraction in terms of relative economy.

It still stands, however, that the most significant cost-reducing factors are savings in time and labor.

The total time required in an application such as the Creative Industries fabrication of hammer forms — taking the plaster from the model, drying it, sealing the mold, mixing and pouring the resin, curing, and preparing the tool for use — can be as low as 24 man-hours. It needs no further emphasis to make clear the extreme importance such time savings can have in maintaining the schedules of a tooling program.

end

All photos with this article: courtesy the Marblette Corporation.

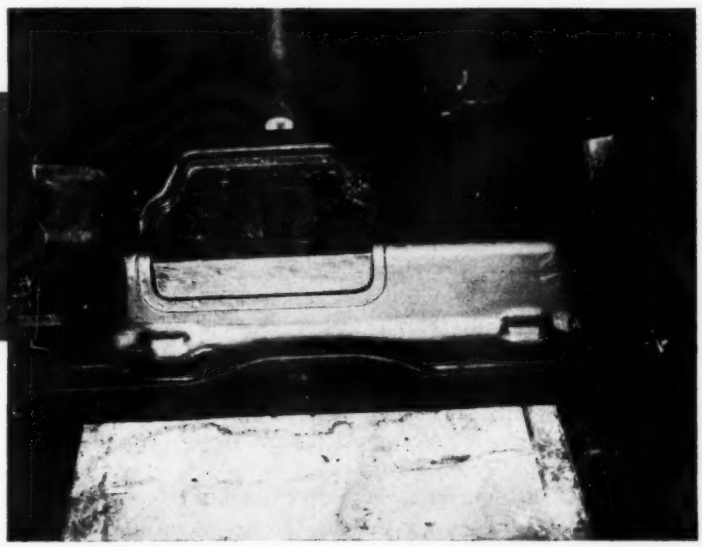
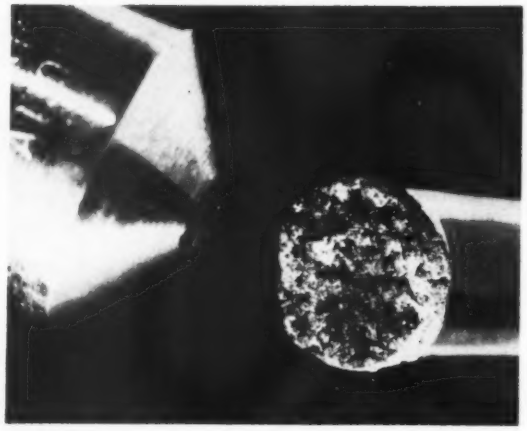


Fig. 7. Thanks to the virtual absence of shrinkage, "barbering" of the finished epoxy hammer form is unnecessary. The plastic tool is ready to go to work after a fabrication period that represents big savings in time and labor over production of conventional tools of other materials.

Pilot Production Foretells Future of

MAN-MADE DIAMONDS



This cluster of some of the first man-made diamonds, about ¼" dia, is compared with a Rockwell hardness tester.

PILOT PLANT PRODUCTION of man-made diamonds has been so successful that Dr. C. G. Suits, General Electric's vice president and director of research recently assured Industry that they will "have an important impact on American Industry and defense."

"Home-grown diamonds will give the U. S. an independent source of a vital commodity," he said in presenting a cluster of the first man-made diamonds made by General Electric to the Smithsonian Institution.

"Industrial diamonds could become a $200-million annual business within the next decade," reports J. S. Gillespie, manager of the diamond project at Carboloy Department of General Electric, "if their cost can be brought down below those now being mined."

Limited quantities of the diamonds are now being produced at the Carboloy Department's Detroit pilot plant.

Since 1954, when the first diamonds were made in the G.E. Research Laboratory in Schenectady, scientists have been making steady progress in bridging the gap between the first experiments and the production line. The two main areas of concentration now, says Gillespie, are quantity production of man-made diamonds and achievement of a marketable price.

"The fascination and beauty of diamond gem stones," says Dr. Suits, "sometimes obscure the real importance of this unique substance for manufacturing." The commercial importance of diamonds, he explains, stems primarily from their incredible hardness, which is important for jewelry as well as for industrial uses.

"Cutting and grinding operations are basic to a large segment of Industry, and the speed and efficiency of these operations is a multiplier that exerts great leverage on the American economy. This fact becomes increasingly important as industrial technology produces even stronger and harder materials in support of the inexorable competitive demand for higher temperature, higher speed, higher stress and higher mechanical performance," according to Dr. Suits.

Approximately 90% of the 2½ tons of diamonds now mined each year are imported by the United States. More than $50-million are spent on the industrial diamonds used by the U. S. in a typical year. Fortunately, 80%, by weight, of the industrial diamonds now used by the U.S. are of the sizes that can be produced readily by this process.

General Electric's scientists are not attempting to make stones of gem quality and size, Dr. Suits emphasizes. "The most important prospect from this discovery is that we will be able to make this unique substance available for widespread use in manufacturing."

Because of the potential defense importance of an independent supply of diamonds, all details of the G.E. process have been placed under a government secrecy order. It can be told, however, that in making the diamonds G.E. scientists constructed a special pressure vessel for use in large hydraulic presses, and maintained for long periods pressures of 2.7-million lbs/sq in at temperatures of 5,000° F.

The scientific importance of achieving these unprecedented conditions of pressure and temperature, according to Dr. Suits, "parallels" the industrial importance of man-made diamonds.

end

TOOLING & PRODUCTION Air Power FOR METALWORKING

THE DISTRIBUTION OF AIR

. . . from Source to Use

by William E. Hoffman
Associate Editor

AIR POWER CAN BE THE ANSWER to many of your holding, feeding, lifting and numerous other operations in and around your plant. Are you using air power to its greatest advantage? If you are considering a new air power system for your plant, or if you are considering a revamp of an old system this article will be of interest to you. Its purpose is to provide a broader scope of the problems involved, and discuss the distribution of compressed air from the receiver through the plant to the recipient tools. In subsequent T & P issues discussions will be presented concerning air supply components, such as compressors and aftercooler, and the accessories to be used at the work end of the line.

Most of us take compressed air for granted. When we want it, it's just a matter of reaching for the hose or a few pipe fittings. Or we put in a requisition, and Maintenance complies. Often, too little thought is given to how the air gets to the consumer tools and in what quantity and in what condition the air reaches its destination.

Compressed air must be processed properly if a distribution system is to prove efficient. It is not only necessary that compressed air reach each of its recipients in sufficient volume, but harmful contaminating matter (including water) must be removed and the air must be infused with a lubricant for protection of the equipment to be motivated.

Piping

A compressed air distribution system checklist for proper piping:

1. The main pipe lines and the down lines should be sufficiently large to avoid an objectionable pressure drop when the system is taxed to its maximum. The extra cost of the pipe is negligible and you have the assurance of adequate pressure over the years as pipes become restricted through accumulation of scale and dirt. Pipe sizes should be large enough in order that the pressure drop between the receiver and the point of operation will not be more than 10% of the initial pressure. Reasonable future growth of the plant's requirements also should be considered.
2. If possible, use a loop system for distribution. A loop system gives two-way distribution and helps to maintain constant pressure. See Figure 1.
3. Liberal sized receivers should be located near the points of heaviest use, especially if the distribution lines are long. The proper use of receivers will help to avoid excessive line drop.
4. Outlets from the main or header should be located as close as possible to the point of use. These should come off the top of the main to prevent carry-over of moisture in its condensed state. The manner of take-off should be the long return bend to avoid

restriction. Restrictions must be kept to a minimum. Sharp turns and an excessive number of fittings will cause your supply units extra work . . . and you, extra money.

5. All piping should slope toward a drop-leg or moisture trap and away from the source of supply.

Low pressure is one of the greatest production robbers; the companion loser of dollars is the loss of air through leaking pipes. With the average cost of compressed air about 6¢/cu ft, a large distribution system can dissipate many dollars into the atmosphere.

The most likely locations to look for air leakage are around valve stems, unions, hose connections, drains and lines leading to inoperative equipment or homemade devices.

Checking for air loss in the form of leaks at these spots should be done on a regular scheduled basis. Such checks can be made in several ways. The most inexpensive method is by candle if the room air conditions are quiet enough so that only the leak affects the flame. Soapy water can easily be brushed around joints in which case you look for the bubbles. Another method is the sniffer-test where oil of peppermint is introduced into the system. Regardless of the way in which you detect the leak, repair it immediately and save money.

Special attention should be given to pipe lines or hose lines which receive unusually severe treatment. They should be inspected regularly and protective material applied where necessary.

In case flexible hose of the woven cover type is used, it should be installed according to the manufacturer's specifications. There is a right and a wrong way of using flexible tube or hoses.

Relieve the strain on your pipe fittings by proper support wherever needed. If your piping is not continually working and moving, your leakage will be nil.

If you are thinking about a larger compressor, first look to your piping efficiency and soundness. This may be your answer to low pressure and line pressure drop at peak demand.

Filters

Clean air is of vital importance. Dirt and moisture can cause serious abrasive and corrosive damage to mechanical equipment.

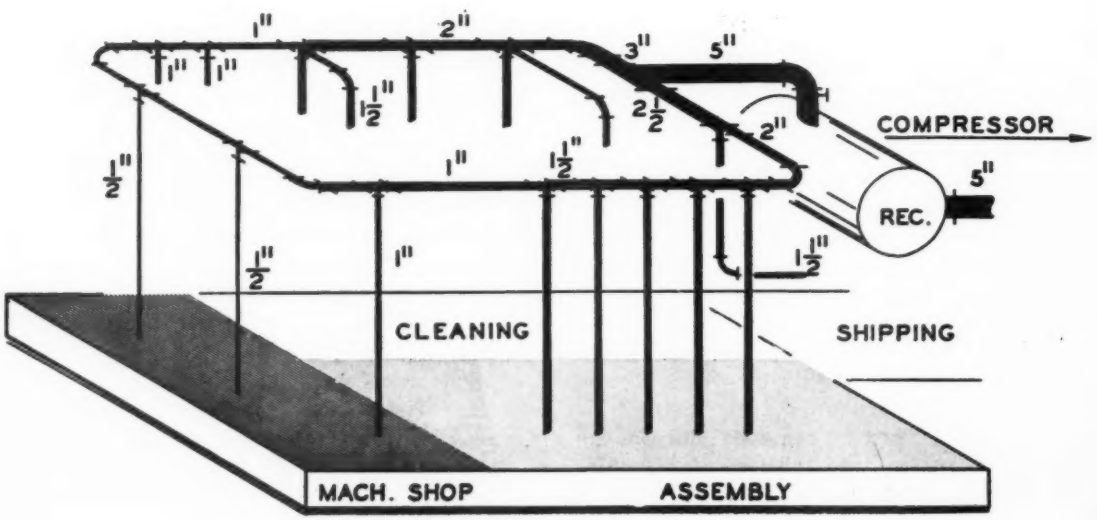
Contaminants are either liquid or solids.

Since air expands and cools as it passes through the piping, moisture is condensed and is present in quantities of water.

The solids might be small particles of matter taken into the system in the vicinity of the compressor air-intake which passed through the filter at that point. Or the solids could be pipe scale which has been shaken loose or loosened by the force of the air passing through the lines. Present also are traces of tar and shellac which result from the breakdown of compressor lubricating oils.

For removing these undesirables there are various filtering media, such as screens, porous stone, sintered metal, phenolic laminates, etc.,

Fig. 1. This drawing illustrates a hypothetic "loop" distribution system, supplying 500 cu ft/min. It shows the receiver close to the departments having the heaviest air demand, and the reduction of pipe size as the demand decreases. For more detailed piping see Fig. 2.



PROPER AIR LINE INSTALLATION

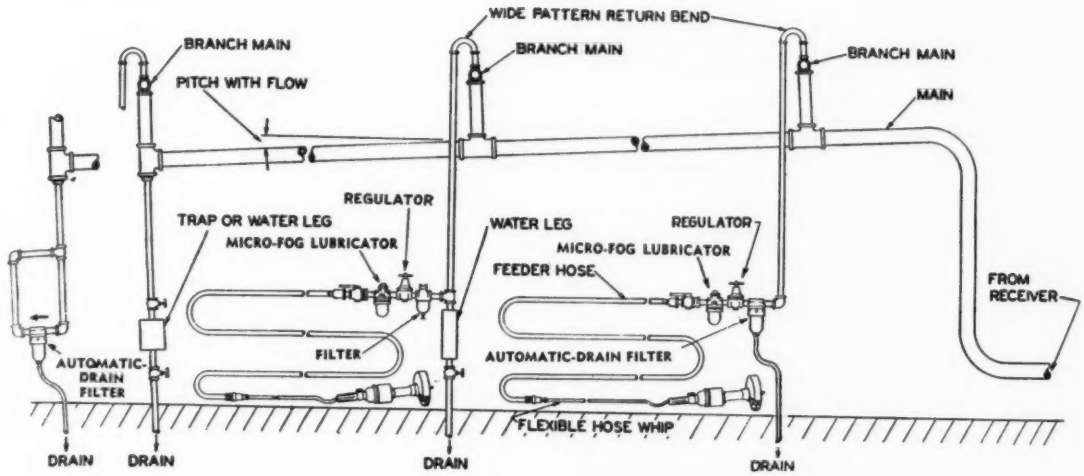


Fig. 2. Proper air line installations are shown in this diagram which was furnished by the C. A. Norgren Co., of Englewood, Colo. Norgren supplies Industry with air line components of many types. The diagram is a composite, showing air line distribution inserts, which might be necessary in any compressed air system.

which should do their work as close to the consuming device as is possible.

When specifying a filter, we usually speak in terms of the size of the foreign particles which the filter in question will trap, and keep from passing further into the system. The size of the particles to be excluded from the system by the filter is usually given in microns. One micron is 0.000039″ in dia. For example: a dust particle might be in the 25-micron size range, which would mean that its largest dimension in any direction would not be larger than approximately .001″. Screen filters will not generally trap particles smaller than 74 microns — this would be a 200-mesh screen. If smaller particles were to be retained, it would be necessary to go to a more specific filter than the screen.

The filtering out of moisture in most cases is not actually filtering; stopping moisture is usually accomplished by controlling or forcing the air to flow in a definite pattern as in a spiral, at high speed. The moisture is then actually slung out by the centrifugal force. All filters are not engineered for this service although they are suited to filter solids effectively.

Filters employing hydroscopic materials, as a means of removing moisture, have their place if extremely dry air is necessary.

Filters are supplied in many designs. Some can be flushed without removing the filter element, while others have the removable element which can be replaced without taking the housing from the line.

Many combinations of filters, regulators and lubricators are available. Due to the diversity of Industry, it is understandable that all filters, regulators and lubricators will not suit all cases. Within any one system, some air applications require high pressure, some low, while others may demand various degrees of filtering and lubricating. The nature of the equipment serviced by the compressed air is the starting place for your supplier's service engineer; the more completely he is equipped with pertinent facts concerning your operation and its end result, the better able he will be to make reliable recommendations. If your air line demands have the slightest tendency to be complicated, it is best to ask for recommendations, since many sizes of each accessory are available. If too small, it will not accomplish the desired results. If too large, it may cost you more than one of a more appropriate size.

Regulators

Like most facilities for our everyday work and play, compressed air does a better job if used properly. It is expensive in several ways to use more air pressure than is needed, or too little. Most air equipment works best at its predetermined pressure. If the pressure is too high, there will be excessive wear and erratic action; if the pressure is too low, the efficiency of the tool will drop. Of no little consideration

is the extra cost of wasted air as well as the added maintenance factor.

If a pressure regulator is used in conjunction with a filter and a lubricator (and this is most always the case), it should be placed between the two. If for some reason one or the other of the two adjacent units are omitted, the regulator will still be in the same respective relation to the remaining accessory, upstream or downstream as the case may be.

For a detailed description of air pressure regulators and how they work, please refer back to a feature in the November 1954 issue of TOOLING & PRODUCTION entitled, "Air Pressure Regulators—What They Do and How They Do It". This article, page 79, was written by E. W. Veres, chief development engineer for Arrow Tools Inc., Chicago 23, a leading manufacturer of regulators.

It can be perceived from the illustration Figure 2 that the filter is always on the upstream side of the regulator and the lubricator logically on the downstream side.

Most compressed air systems require a regulator of some size or type. For the more complex systems, servicing equipment having a variety of pressure demands, it may be necessary to have a regulator for each piece of equipment.

Water Traps

Since water is a by-product of a compression system because of the compression and expansion involved, drains and water traps should be provided along the mains to collect the excess water which will condense in the pipes. These drains, often called water-legs, are not to be confused with the filters which are usually necessary to remove the more minute particles of moisture.

Water traps should not be used indiscriminately; but, used frequently they can relieve the load on the combination filter and moisture traps close to the destination of the air.

Many filters have automatic moisture drain traps for use in compressed air systems where constant attention to hand draining would be prohibitive. If an automatic trap was not included in the initial equipment, it can be added later as an adaption.

There are numerous types of traps available. Attachments or original equipment pieces, automatic or manual drain types — your need will dictate your purchase.

Lubricators

The purpose of the lubricator is to provide a method of lubricating air tools that have no other means of combating friction and wear, and to help prevent oxidation within the distribution system to allay the formation of scale and corrosion.

There are various methods of accomplishing this, all having the purpose of imparting to the clean dry air an oil fog. The more finely the oil is dispersed, the farther it will travel through the lines before breaking down into droplets. If it can reach the equipment as a fog, it can do a better job of lubricating.

The proper selection of an air line lubricator will necessitate an understanding of your operation. Although most of these units for metering oil into the system are adjustable, it is necessary that a unit large enough is chosen in the beginning. On the other hand one too large is a waste of money.

The increased emphasis on the use of compressed air has proven that this power media is among the foremost. If it's a new plant you are considering an air distribution system for, it is essential that you install equipment of sufficient capacity. Your plant will find many unforeseen, profitable uses for air versatility. It is prudent to provide ample processed air over and above your anticipated requirements. end

Revised Standards Manual Available

Additional data, much of it in tabular form, is contained in the revised manual on Machine Tool Electrical Standards issued by the National Machine Tool Builders' Association. It is the work of an Electrical Standards Committee of the Association headed by E. J. Loeffler, chief electrical engineer, The Warner & Swasey Co.

The new standards have been developed specifically for application to machine tools. Many of the suggestions in the manual are the result of meetings held with representatives of the mass production companies represented in the Joint Industry Conference which was formed at the close of World War II by the Association.

A clearer distinction between practices that are mandatory and those that are simply recommended is provided. The manual also details such subjects as motor and circuit protection, control circuits and circuit enclosures, and specifications for conductors. A section composed of much new material is devoted to raceways and junction boxes. In addition, a 3-page index and glossary of electrical terms has been added.

Copies of the revised manual can be obtained upon request to the National Machine Tool Builders' Association, 2071 E. 102nd St., Cleveland 6.

Automated Screw Feeding Speeds Assembly Time

WITH THE AID OF automated Pneuma-Serve screw feeding, a fastening operation that formerly required two persons is now being performed by one person, in half the time, at the Grimes Manufacturing Co., Urbana, Ohio.

One employee formerly placed screws by hand in phenolic fibre terminal boards for refrigerated compressors, and another employee drove the screws with a hand power tool. Combined time was 11½ man-hours for completing 1,000 assemblies, each requiring six No. 8-32 brass machine screws, ⅜" long, with slotted binding heads.

With the Pneuma-Serve, which delivers screws automatically from a hopper to the driving position and thus eliminates all hand placing, one operator completes 1,000 terminal boards in 6 hrs, 10 min.

To prevent misalignment of the blunt machine screws which would cause cross threading, Grimes and Pneuma-Serve engineers developed a double foot which is affixed to the head of the Pneuma-Serve. Base of the foot is almost flush with the tip of a screw in driving position, so that the screw cannot get out of alignment before the driving bit is engaged.

A special nesting jig was also devised, with clearance holes for the threaded inserts into which the screws are driven. The jig not only permits screws to be driven freely without coming in contact with the work bench, but it also anchors the boards in place.

Inserts are assembled into the oblong, irregularly-shaped terminal boards, measuring roughly 3" x 2", on a punch press. Straps and eyelets are also put on the boards with an air press before the boards arrive at the screw driving station. **end**

SURFACE GRINDING OF PLANER KNIVES

Photos courtesy of Mattison Machine Works, Rockford, Ill.

TOLERANCES MUST BE very closely held on the thickness of woodworking planer and jointer knives, made of thin high-speed steel, partly because any variation in thickness from one end to the other would introduce complications, balance-wise, where the cutters are used. Three or four of these thin, hss cutters are held in slots milled in a special cutterhead, and the cutterhead is revolved at a speed not less than 3,600 rpm.

This is the standard speed used on the average woodworking planer, where a 60-cycle current is employed. However, there are cases where these knives and cutterheads are revolved at higher speeds, a frequency changer being employed for stepping up rotary speed. In some instances, cutterheads of this type may revolve as fast as 7,200 rpm.

When it is considered that centrifugal force varies not as the speed, but as the square of the speed, it is readily appreciated that even infinitesimal differences in weight as between the two ends of a planer knife are important, balance-wise. It is also important that a high-class finish be obtained on surfaces of these cutters, which are sharpened by grinding a bevel on one edge. Quality of finish on the knife surface has much to do with the quality and keenness of knife edge obtained.

Such knives are normally held on a magnetic chuck for surface grinding. There is an interesting distinction between woodworking cutters and those produced for metalworking, i.e. such magnetism as may be retained by woodworking cutters has no particular consequence in reference to their subsequent use. Cutters used in the metalworking industry, if held on a magnetic chuck, must positively be de-magnetized, to insure that no chips will adhere to them in operation. Magnetism which may continue to reside in woodworking cutters, however, will not attract wood chips or dirt.

A highly interesting instance of production surface grinding on wood planing knives is found at Lancaster Machine Knife Works, Lancaster, N. Y., where a Mattison horizontal spindle grinder, carrying a 168" magnetic chuck, is employed to grind both sides of such knives. Wood planer knives of this type sometimes run as long as 48" or more, while jointer knives may run as short as 6". The knives are made from high-speed steel 6566, and have a Rockwell hardness of 64-65C. Parallelism between the two sides of the knife is held within .0005", and a finish of 12 micro-inches is obtained.

View of horizontal spindle grinder at Lancaster Machine Knife Works, Inc., surface grinding woodworking planer knives. .The knives being ground are 36" x 1-1/2" x 5/32". In this particular case, an order of 24 is being ground at one time, although the magnetic chuck has capacity for a larger number.

About .018" of stock is removed from each side. A 60G-8VBE wheel is employed, rotating at 1440 rpm, and a table travel of 90 fpm is used. Knives are placed on the chuck manually, and Codol is employed as a coolant, mixed 1 part Codol to 150 parts water. According to Mr. Earl Myers, assistant superintendent, production has been increased 100% by this method over the one formerly employed. A much better micro-finish, resulting in a better-quality product, is obtained. Accuracy has also been increased by 25%. end

Close-up of woodworking planer-knife grinding operation at Lancaster. While in this case 24 knives 36" long are being ground, 66 knives 15" x 2" or equivalent are usually ground at one time, in 2-3/4 hrs.

A New System for Extremely Precise Control of Linear Positioning of Machine Tool Movements*

by Frans Brouwer
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Electronics Division
CANADIAN WESTINGHOUSE COMPANY, LTD.
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THE BASIC MOTIONS in machine tool operation — indeed in the manipulation of all objects — are rotation and translation. Thus, to use electronic computers to control the movements of machines effectively, it is necessary to employ devices for the conversion of electrical signals into translation or rotation and for conversion of motion into signals. Such devices, commonly called transducers, are well known to designers of machine tools.

A new type of transducer recently developed by Canadian Westinghouse allows the measurement of linear displacements to accuracies of 0.0001″ over distances of the order of several feet. This new transducer is expected to bring a new measure of simplicity and reliability to such measurements. It is evident that the device can be applied to milling machines, lathes, boring mills, jig borers, and all types of special machines in which cutting tools must be positioned with great accuracy. In this discussion we will consider the application of the transducer to the position control of an engine lathe turning tool.

The accuracy of transducers is usually expressed as a percentage of their full range. Transducers in common use, such as synchros, differential transformers and precision potentiometers, have accuracies of the order of 0.1%. However, the cost of such transducers increases exponentially with the increase in their accuracy. Few of these transducers have accuracies better than 0.02% and frequently such accuracies cannot be maintained throughout a reasonable lifetime for the component.

While a precision of 0.1% is usually quite adequate for the measurement of rotation in machine tools, it is obviously inadequate for measuring linear motion. It is frequently required to measure small linear displacements with accuracies of 0.0001″ while an accuracy of 0.001″ over a distance up to 100″ is not uncommon. This imposes an accuracy requirement on the transducer of better than one part in 100,000 or 0.001%.

One way to meet such exacting requirements for great accuracy is to use a standard transducer, such as a synchro, and a repeating linkage, such as a lead screw. A counter to measure the number of rotations of the screw on which the transducer is mounted is necessary to distinguish between the various revolutions. Although lead screws can be made with extreme accuracy, such systems suffer from wear, backlash, and the unpredictability of oil film thicknesses. These effects impair the accuracy of the system as a whole. This is particularly true when the lead screw is also used for power transmission.

Other systems available to provide such high accuracy include optical gratings and counters that measure displacement by counting a number of light extinctions. Generally, however, these systems are costly, fragile, difficult to align over longer distances, and require a large bulk of associated electronics equipment.

It has been the first object of the Canadian Westinghouse electronic control development

*Presented at the 20th Annual Machine Tool Electrification Forum; sponsored by the Westinghouse Electric Corporation, Buffalo, N. Y., April 1956.

Fig. 1. In its first application, this new transducer is utilized for position control of an engine lathe.

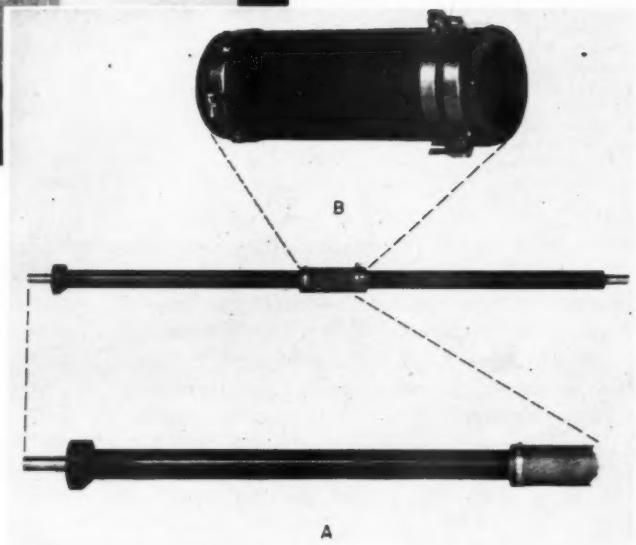


Fig. 2. (A) The long bifilar primary coil of the transducer is formed by windings placed in grooves of a two-start spiral (B) Electromagnetically coupled to the primary, the secondary is a bifilar coil wound inside a sleeve.

program to devise ways and means to solve this linear positioning problem. One major result has been the development of a linear displacement transducer, capable of measuring to the required degree of accuracy and with high reliability. This transducer can be made in quantity production at reasonable cost. Applications for patents have been filed and it has already been utilized in a simple positioning system for demonstration purposes, Figure 1.

The transducer, Figure 2, consists of two parts which are electro-magnetically coupled. The primary part is a long cylindrical bar of solid insulating material or a bar coated with insulating material. In this bar two grooves are cut in the form of a two-start spiral. Wound in these spiral grooves are wires which are joined together at one end of the bar and connected to slip rings at the other, thus forming a long bifilar coil, Figure 2A. The secondary part of the transducer, Figure 2B, is similar to the primary part. It is also a bifilar coil, but is wound on the inside of a sleeve which though fitting snugly can yet slide over the primary part of the transducer.

Two cross-sections of the transducer, Figure 3, show the wires of primary and secondary parts in different relationships. Small circles and crosses indicate the direction in which current flows through the wires when a source of a-c power is connected to the primary or secondary coil. In Figure 3A the wires of primary and secondary coil are aligned, giving maximum electromagnetic coupling. In Figure 3B, however, the wires of the secondary coil are located between those of the primary. On each turn of the secondary coil, voltages now induced by currents in the two adjacent wires in the primary coil are equal and of opposite polarity, thus cancelling each other. Zero output voltage is thus obtained on the secondary coil. When the position of the transducer secondary is further changed, the output voltage, after passing through the null position of Fig-

ure 3B rises again until a new maximum is reached when the wires of primary and secondary are realigned. In this position, however, the output voltage is in opposite phase as compared to the position of Figure 3A since the wires of the secondary coil are now aligned with primary wires in which current flows in the opposite direction. It may thus be shown that the output voltage of the transducer is approximately a sinusoidal function of the relative position between the primary and secondary coil. The period of this sine wave is equal to the lead of the transducer coils.

Let us now consider the use of the transducer in a typical positioning system, Figure 4. In this system, a machine tool slide is driven with a lead screw from a servomotor through a gearbox. The secondary coil of the transducer is mounted on an arm on the cross carriage slide, while the primary coil is mounted in bearings so that it is free to rotate around its own axis. This axis is parallel to the direction of motion of the slide. A-c voltage is supplied to the transducer and its output after amplification is fed to the servomotor.

The operation of this simple positioning servo is straightforward: the motor moves the slide until it reaches the nearest position at which the transducer gives zero output. Similar null positions repeat at points that are spaced apart by distances equal to the lead of the transducer coils. Positions in between may be obtained by rotation of the primary coil of the transducer. For example with a lead of 0.1″ a displacement of one mil may be obtained by rotating the transducer shaft 1/100 revolution, or 3.6°. To move the slide over long distances several revolutions of this shaft are necessary.

It may be observed that this system is ambiguous: for every setting of the dial many stable positions of the servo are possible. The arrangement of Figure 5 eliminates this effect by using a "coarse-fine" system. The coarse system is a conventional position servo which finds the approximate position selected by the "coarse" dial. Once this position is reached, the coarse error signal is too small to hold the coarse-fine switch any longer in the coarse position. The "fine" channel is then opened and the system adjusts to the nearest null of the transducer in the manner described previously.

These principles are demonstrated in a diagram of the model built for demonstration, Figure 6. In the model, the coarse dial and potentiometer have been replaced by a standard decade divider with three dials, located in the control unit and calibrated in steps of 10″, 1″ and 0.1″ respectively. The transducer shaft is slaved by a small, simple servo that may be controlled from a three-dial decade divider in the control unit. These dials are calibrated in steps of 0.01″, 0.001″, and 0.0001″.

Let us now examine possible sources of error in the system. Considering the coarse system first, we observe that its function is to find a certain null unerringly. Thus if nulls are 0.1″ apart and the total travel is, arbitrarily, 30″, an accuracy of 0.1% of the coarse system brings us within 0.03″ of the correct position, enabling the fine system to lock into the correct null. Evidently then, errors in the coarse system do not effect final precision.

Four sources of error may be distinguished in the fine system: First, there are those errors due to mechanical disturbances such as force on the carriage or friction. These errors may be eliminated by building a sufficiently large

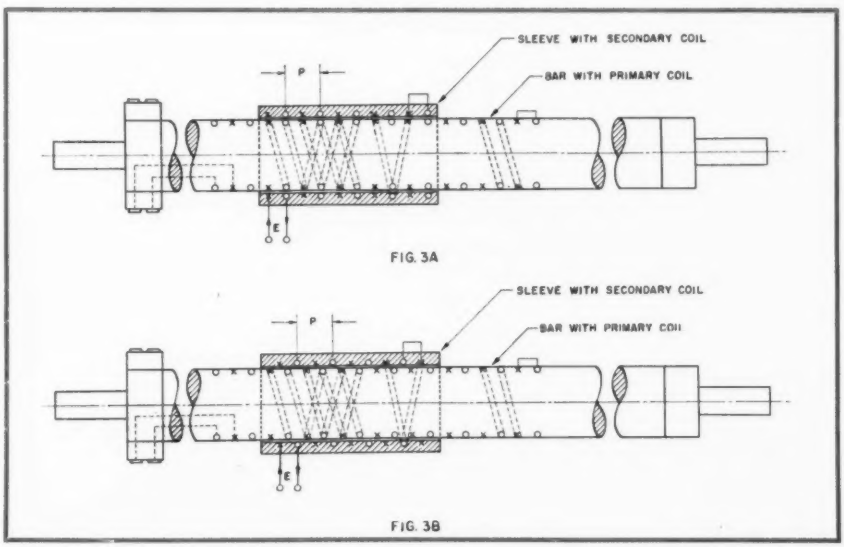


Fig. 3. These cross-sections of the primary and secondary show the coils in different relationships. Electromagnetic coupling is maximum in 3a, minimum in 3b.

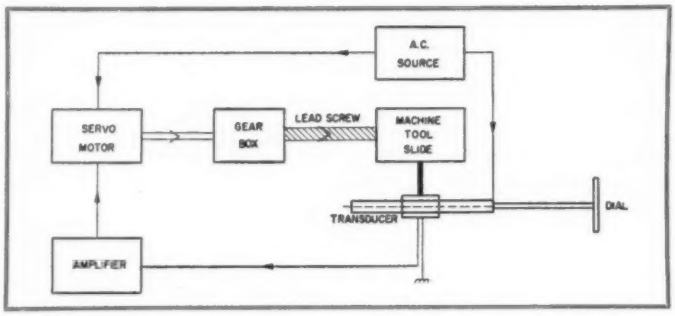


Fig. 4. The transducer applied to a typical positioning system.

force-constant into the system. Even in a relatively small system it is a fairly simple matter to obtain force-constants of 1,000,000 pounds per inch, which is equivalent to a displacement error of 0.0001" for a 100-pound force. This assumes zero backlash and high efficiency in the drive.

The second group is composed of errors due to electrical disturbances, such as supply voltage variations, drift and hum. Since the electrical system is built in the form of a balanced bridge, its precision is unaffected by supply voltage variations. The servo system operates with a 60 cps a-c carrier, obtained from the power line. No d-c links are used throughout the system, thus eliminating any disturbances otherwise caused by amplifier drift. Low 60 cps signal levels are completely eliminated and therefore hum voltages in the system will not do harm.

The third possible error source is in the fine dial repeater servo. A small repeater servo with an accuracy of 0.1% will adjust the transducer shaft to within 1/1000 of a revolution. With a transducer lead of 0.1", this corresponds to a maximum error of 0.0001".

Fourth, errors in the transducer may be of three possible types. First among these three are local errors in lead. Suppose as an example that only one turn of the coil on the transducer shaft is displaced with respect to its correct position by as much as one mil. Since the output voltage of the transducer pick-off coil is the vector sum of the voltages caused by contributing elements, it is evident that with, arbitrarily, 60 turns in the pick-off coil, the error with respect to the correct position is 1/60 mil. This serves to show that the transducer has considerable ability to reduce local errors to a negligible value. Lead errors in the pick-off coil do not affect precision as in every position of the pick-off coil each of its turns is engaged in an identical way.

Lead errors between widely spaced parts of the transducer are not eliminated. They can be reduced, however, by grinding the grooves in the transducer shaft on a precision machine. Temperature errors of transducers can easily be held within very small limits by using materials of low temperature coefficient, such as certain ceramics for small transducers and Invar, coated with insulating material, for the larger ones.

Eccentricity of the two transducer coils has no effect on the position of the nulls as may be seen from physical arrangement of the coils.

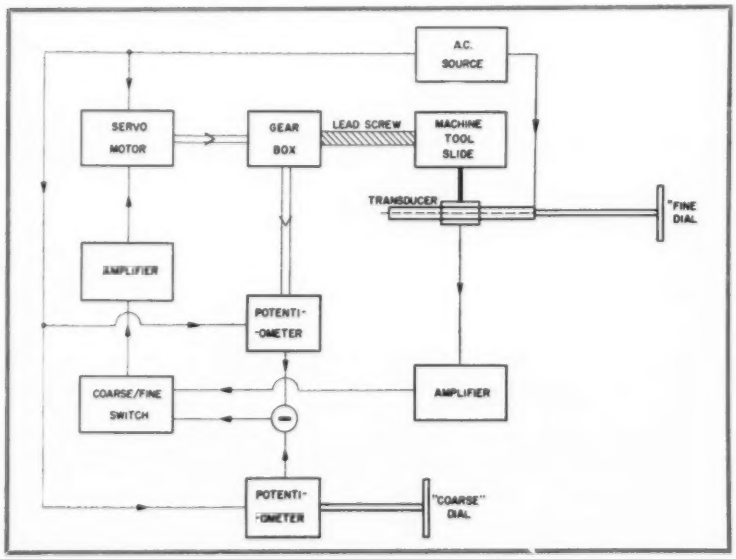


Fig. 5. This "coarse-fine" system eliminates ambiguity and adjusts the entire system to the nearest null point.

It should be noted that wear in the transducer does not effect the location of the wires in it and thus does not influence accuracy.

Regarding machine tools to which the new system may be applied, at present most machine tools, even of the highest precision class, have considerable backlash in their drives. As a rule this does not matter so long as the machine operator has learned to make intelligent use of the controls to eliminate errors due to this cause. If a servo with a reversible drive be built to have a precision comparable to backlash in the system then, unless special precautions are taken, the system is likely to be unstable. These precautions may be effective in stabilizing a system with high static accuracy, but experience shows this to be at the expense of dynamic accuracy. The most satisfactory answer seems to be the elimination of backlash.

Lead screws with spring-loaded split nuts represent a solution which is particularly satisfactory when ball screw-nut assemblies are used. The much higher efficiency of the drive allows the use of smaller servo systems that more than compensate for the higher cost of the ball screws. Another solution may be the use of electrohydraulic systems in which backlash is basically different from that in mechanical systems. In large systems with several servo-controlled drives the expense of hydraulic cylinders, servo valves, and pumps may well prove to be lower than those of servomotors, power amplifiers and backlash-free transmission.

Finally it should be remembered that the accuracy of machining does not depend on the measuring system alone, but that final precision is affected by resilience between the point of measurement and tool, by tool wear and by material properties. All these play a part. Very sturdy machine construction and the use of tungsten carbide, ceramic, or diamond tools are desirable to reduce these sources of error.

It has been shown that extremely accurate positioning systems may be built with the new transducer. The possibility of continuous fine adjustment over its full range makes the transducer eminently suitable for precision programming and its greatest merit will be as a link between computers and machines. In addition to numerical control from a set of dials for each coordinate, correlated control through tape or punch cards will permit several coordinates to be controlled simultaneously. This will be an important application in the machine tool field. Besides improving production of standard parts, nonlinear shapes may then be machined with the precision which is at present obtainable for standard parts. This flexibility may be equally advantageous to large and small organizations, since machines with multiple-coordinate programmers may make small production runs economically attractive.

Computer controlled machines are economically and technically feasible and the next decade will see an ever-increasing number of applications. It is believed that positioning systems of the type described will play an important part in a large number of the automatic machine tools in the near future. **end**

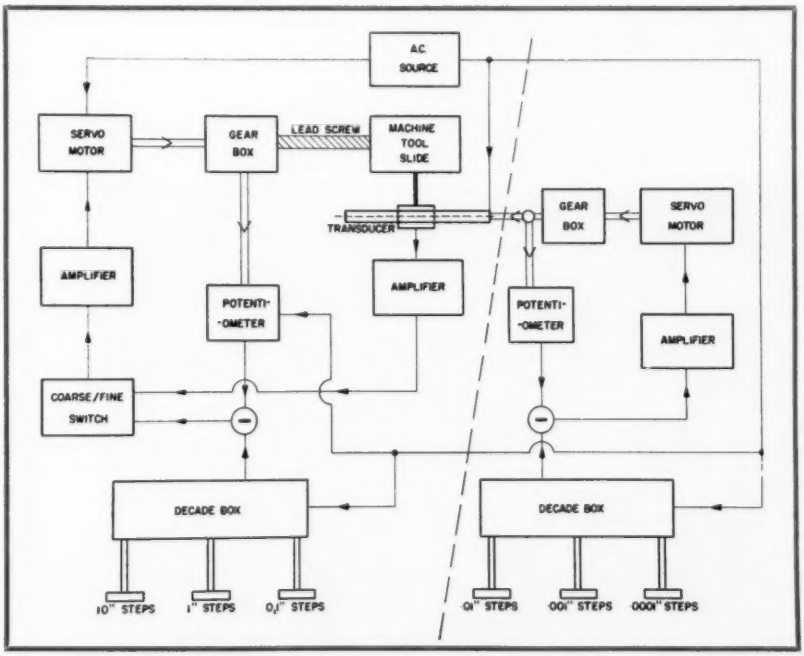


Fig. [illegible] A "coarse-fine" system in which the [illegible] and potentiometer are replaced by a standard decade divider.

Novel Boring Mill Installation

• *Brings Spindle to Work*

• *Uses Permanent Fixtures*

FIFTY TO 60 HRS OF FIXTURE SETUP TIME are saved per month in the machining of turret lathe bed castings with the new twin-column, floor-type, horizontal boring mill at The Warner & Swasey Company in Cleveland. Time-saving secret lies in its use of permanently located fixtures at four work stations and a traveling spindle column.

The novel installation, conceived by George Kluter, W & S works engineer, and built by Lucas, enables the operator to take the machine spindle to the work, rather than the work to the spindle as with conventional horizontal boring mills.

Fixtures for each of the four different saddle type turret lathe beds being machined are permanently mounted on individual, floor level, cast iron stationary tables. At right angles to these tables, two 40′ rails permit the mill's twin columns to be moved individually, as desired, from one fixture to another. Longitudinal movement of the columns is obtained by clutching a revolving nut onto a stationary screw mounted between the rails. All motions are under pendant pushbutton control, with an operator regulating each of the machine's columns during simultaneous operation.

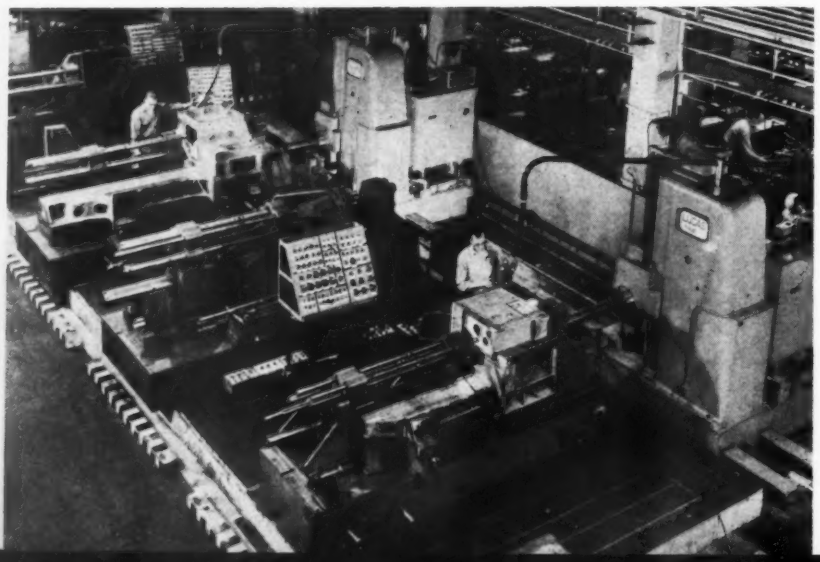
Cost of the complete machine, including installation which requires a 20′ x 40′ excavation, was approximately two-thirds that of two conventional boring mills. If production schedules require it, a third column can be added without increasing the present floor space.

The use of floor level fixtures with the new mill has enhanced operator safety. No longer necessary are cat-walks and guard rails as previously required when the fixtures were mounted on conventional height boring mill tables.

Tool boards conveniently located beside each fixture also contribute to setup time savings. They are sectioned off representing individual bores in the headstock. Each section contains the necessary rough and finish carbide boring bits to complete the various diameters and faces which comprise one bore.

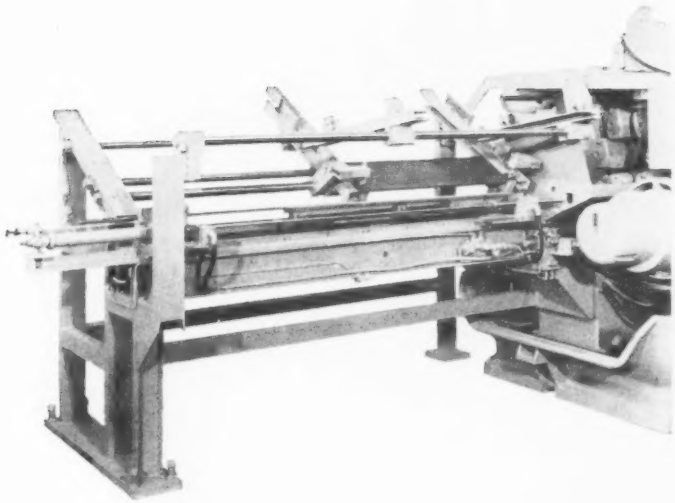
The company also reports greater flexibility with the new installation in the machining of the company's various saddle type bed structures. Even a single bed for a given turret lathe model can be machined economically.

The problem of frequently handling and storing large heavy fixtures is also solved, since they now remain permanently mounted on the boring mill's stationary tables. **end**



The mill's traveling spindle columns, under pendant pushbutton control, can be moved from one permanent fixture to another. Special tool boards are located beside each fixture.

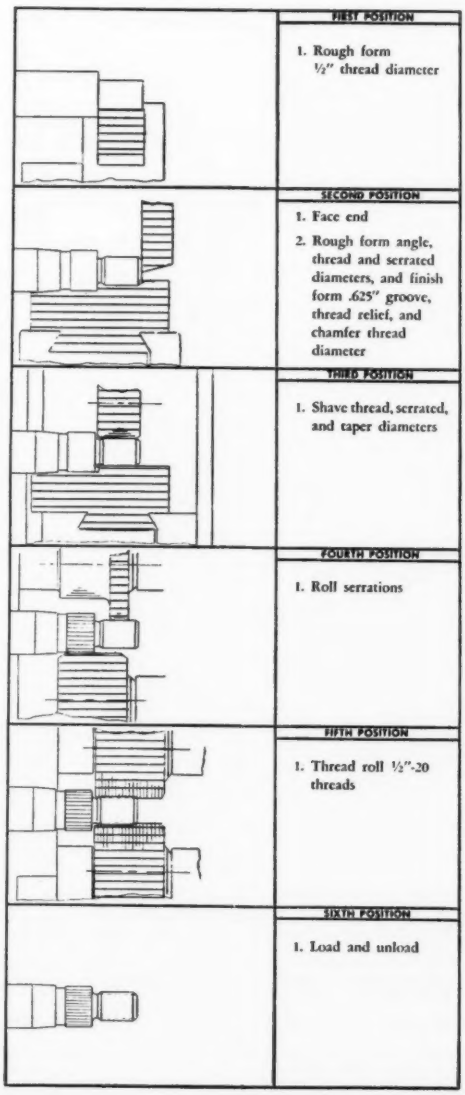
MACHINING LONG SHAFTS ON A 6-SPINDLE MACHINE

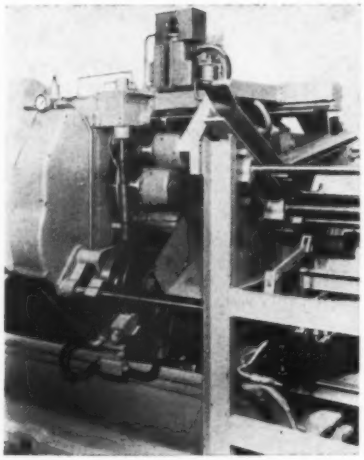


HIGH-SPEED MACHINING of the 39″ precut shaft, shown above, is profitably handled on a standard Greenlee 1⅝″ 6-spindle automatic arranged with a special stock-feed mechanism. This 39″ shaft is machined from ¾″ round C-1026 steel in 11.5 sec at a gross production rate of 313 shafts/hr. The toolslide stroke is 9/16″ with .0064″ feed on the endworking tools. A spindle speed of 573 rpm is used, producing 112 sfpm on the outside diameter.

Loading and unloading of the shafts is performed in the sixth position and the machining in the remaining five cross-slide and toolslide positions. All machining operations are performed close to the spindle nose. The outside diameter of the shaft is rough formed in the first position, finished formed in the second, and shaved in the third position. A special serrating attachment, mounted in the fourth-position forming-slide cavity, rolls 36 serrations on the outside diameter of the shaft.

The precut shafts can be loaded from either side of the machine into the adjustable V-type magazine. The magazine is designed so that the shafts will roll down into the loading cradle. A releasing mechanism, actuated by a mechanical linkage to the cam drum, automatically releases the shafts one at a time into the


FIRST POSITION
1. Rough form ½″ thread diameter
SECOND POSITION
1. Face end
2. Rough form angle, thread and serrated diameters, and finish form .625″ groove, thread relief, and chamfer thread diameter
THIRD POSITION
1. Shave thread, serrated, and taper diameters
FOURTH POSITION
1. Roll serrations
FIFTH POSITION
1. Thread roll ½″-20 threads
SIXTH POSITION
1. Load and unload

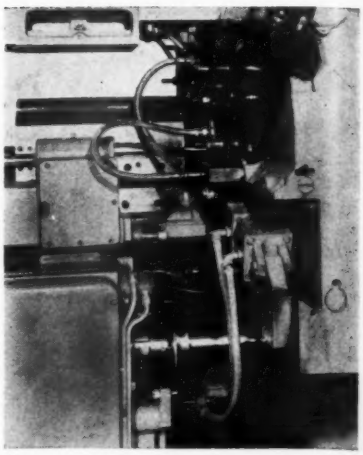


loading cradle. An air-operated loading head pushes the shaft into the sixth-position collet. The forward and return movement of the loading head is controlled by an air cylinder equipped with a Hydro-Check.

As the new shaft is being fed into the collet in rapid approach, it pushes the completed shaft ahead of it into the rollers of the live-roll attachment, which is mounted on the threading feed box. The new shaft is then slowed down toward the end of the feed-out by the Hydro-Check. This slowing down action allows the live-roll attachment to accelerate the finished shaft far enough ahead of the new shaft being loaded so that the air-operated stock stop can drop down into the feed-out position and accurately position the new shaft at its correct feed-out length. While this is being done, the completed shaft is pushed through a sleeve in the gear box and out the front into an out-feed hopper by the live-roll attachment.

The coordinated activity of these operations is electrically interlocked by limit switches, so that in the event any one of these operations fails to function normally, the machine automatically stops. All air cylinders are controlled by cam-actuated valves, operating in conjunction with an air bleeder system.

This machine can also perform a turning, facing, or drilling operation on the back end of a shaft, providing the shaft is long enough to project



beyond the rear of the spindle assembly. The tool holder for the machining operation rides on gibbed ways at the rear of the fourth position spindle and is moved forward at the required feed and returned by a gear-and-rack mechanism, which is actuated through a mechanical linkage from the cam drum. **end**

Case history, courtesy of Greenlee Bros. & Co.

Eight Major Advances In Die Set Building

A new line of press accessories has been evolved that makes available to diemakers a more complete selection of die sets and diemakers supplies.

These die sets, known as the Danly "Leadership Line", have a higher degree of uniform and dependable accuracy, and a longer service life than any previously offered.

The Danly Machine Specialties, Inc., of Chicago 50, has instituted precision assembly-line methods of manufacturing which also permit faster service on all of these new products.

The eight major advantages of these new die sets are: (1) Precision lapped chrome-plated guide posts. These "Microme" guide posts provide exceptionally high resistance to wear. (2) Demountable bushings are an optional feature. Steel shoulder bushings prolong die set life. (3) Oil fittings are positioned so that they are easily reached from the front or side of the press, and will not interfere with die regrinding. Figure 8 oil grooves distribute an oil

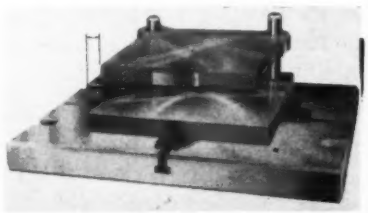


Fig. 1. View of new Danly die set on bolster plate showing new clamping method devised to provide additional die space. Guide posts are chrome plated. All four working surfaces are ground for accuracy in positioning. One guide post is ½" longer than the other, thus providing easier disassembly for die work.

film between guide posts and bushing surfaces. (4) A complete new line of long and short shoulder bushings of hardened steel, plus shoulder bushings of special-alloy hard bronze. (5) A simple clamping method for die sets which have a right to left area dimension (ASA specifications) of 20" or more. This method is faster and easier to use than previous methods. (6) One guide post made ½" longer than the other makes easier removal of punch holder during die making, die setting, and regrinding. (7) Danly precision die sets meet or exceed all ASA standards. (8) All four horizontal surfaces are ground to a high finish, to attain the highest possible degree of accuracy in positioning the die sets.

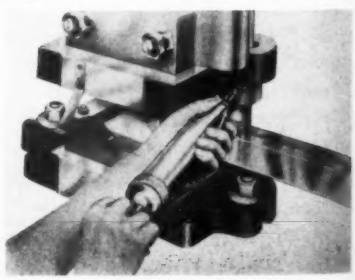


Fig. 2. Danly bushing shoulders are equipped with standard fittings which are easily reached with a lubricating gun for lubricating the guide posts.

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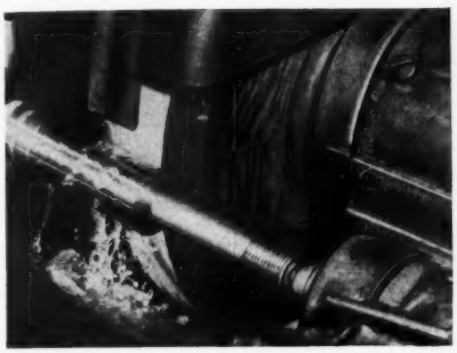

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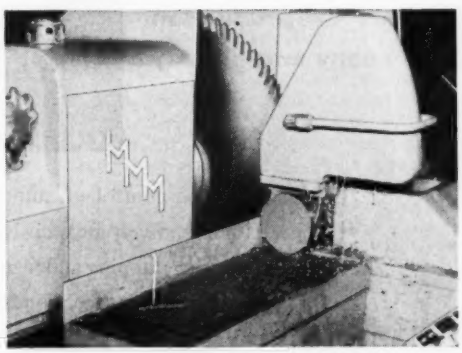

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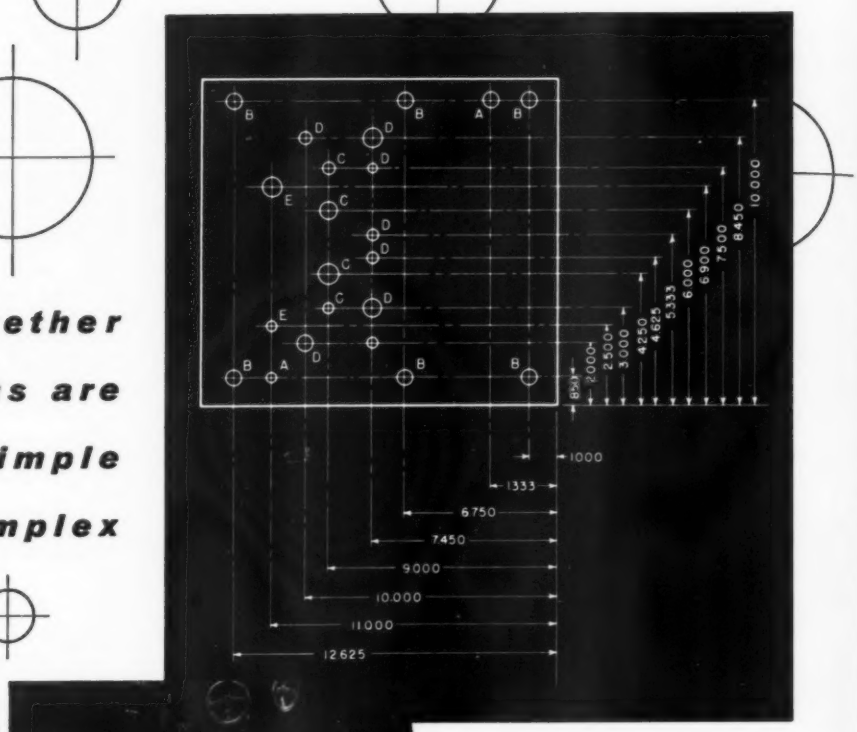

The "Micro-Positioner" makes possible repetitive reproduction easily and quickly

This unique tape-controlled, automatic positioning table fills the need for a relatively inexpensive, yet accurate (.001"), table for drilling, reaming, tapping and many other operations. A sensing mechanism that "feels" indentations in a steel tape directs the movements of the table in the horizontal plane, either laterally or longitudinally. Easily portable, the "Micro-Positioner" may be moved from one machine to another as production requires. Used in combination with radial drills, milling machines, turret drills or other suitable spindles, this unit results in a universal production machine of unlimited potential.

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When setting up the equipment for the pattern illustrated, no center punches are required. Operator positions the bilateral tables and indents the tape where the hole is to be machined. In operation, the table indexes rapidly (90 in./min.), then slows down (6 in./min.) as it comes accurately into position over the point of intersection.

- **A** *Ream for 3/8" dowel (2 holes)*
- **B** *Drill for 13/32" diam. (6 holes)*
- **C** *Drill for 11/32" diam. (4 holes)*
- **D** *Drill for 1/4" diam. (6 holes)*
- **E** *Drill for 17/64" diam. (4 holes)*

For detailed information, write for Bulletin TP-7

THE MICRO-POSITIONER CORPORATION

716 Wilshire Blvd., Santa Monica, California

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Automatic Set-Up Clamps Increase Machine Production

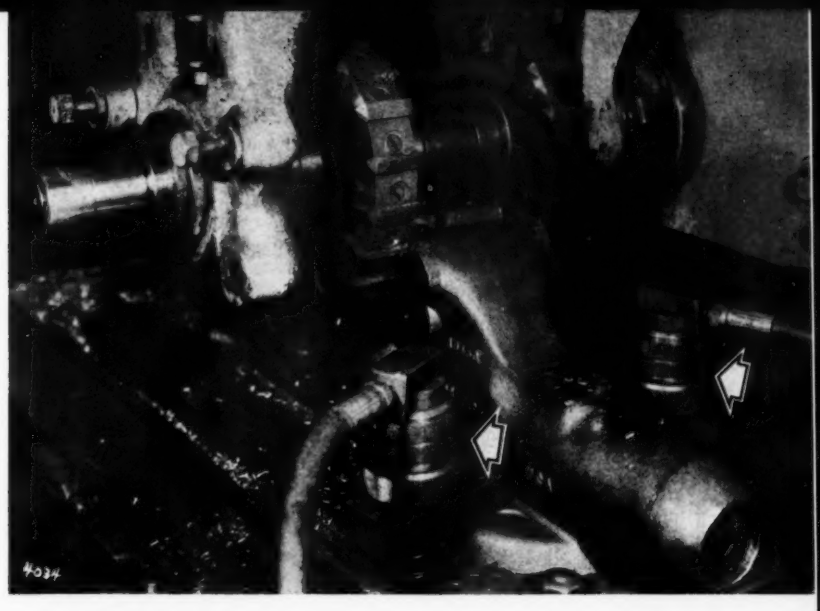

Figure 1

THE RECENT DEVELOPMENT of air powered hydraulic set-up clamps permits a sharp reduction to be made in non-productive machine time on a wide range of operations. A major factor in total machine time not spent in making chips is the time expended in loading work and in clamping and unclamping.

Especially in job-lot production, where the combination of awkward work shapes and short-runs has often defied economical automatic fixturing, the new automatic clamps should prove a real boon to increased productivity.

Developed by Wilton Tool Mfg. Co., Inc., the heart of the new clamp system consists of a stud and a power head. The power head is operated by hydraulic fluid fed through a flexible hose from an air-hydraulic booster cylinder. Hydraulic pressure in the head activates a piston, which has a ¼" maximum stroke and exerts from 1,500 to 7,500 lbs of clamping pressure.

Two types of clamps are available. The one with most universal use is the screw-on type. This has a stud that passes all the way through the clamping head and is threaded at both ends. The one end can be attached to a tee-slot nut, an ordinary hex nut, or can be screwed into a fixture. A nut on the stud over the head holds it in place, and clamping force is exerted by movement of the piston. The clamp is stationary and is not moved during loading and unloading.

For those jobs that necessitate complete removal of the clamping head or bridge after each work cycle, a snap-on type head is used with a stud that is threaded on the lower end and grooved in the other. When power is applied, hydraulic pressure forces bearing balls in the head to engage the stud groove and grip it securely. At the same time, the piston is forced downward, exerting clamping force on the workpiece.

Wilton's air powered hydraulic set-up clamps have been very effectively used in Wilton's own plant, over an extended period of time. They eliminate manual wrench tightening in four ways: (1) holding work directly to a machine table, (2) holding work to a fixture, (3) holding parts of an assembly together, and (4) as an integral part of a work holding fixture.

In one application, at Wilton, use of the PowRlock clamps has raised daily production by 21%. One man tends two machines operated simultaneously. Vise castings are straddle milled on the first (Fig. 1) and step milled on the second (Fig. 2). Previously, nuts over hold-down bridges were tightened manually with a steel bar. The bar had to be hammered to get sufficient locking force on larger workpieces. Now, using the same hold-down bridges, a simple movement of the control lever applies full locking force automatically through the power clamp heads. A side benefit on the step mill was double cutter life attributed to elimination of vibration in the workpiece.

On another operation, milling keyways, production was increased 19% by using the new clamps as part of a split fixture. The only change required was substitution of the stud and power head of the automatic clamp for the bolt and hex nuts formerly used. Now, a touch of the control replaces the laborious wrench tightening formerly required. **end**

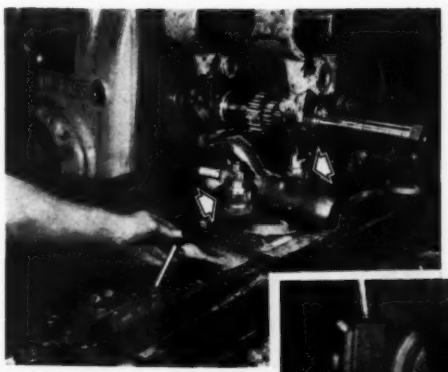

Figure 2

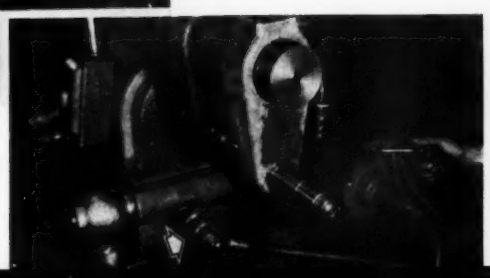

Figure 3

REPORT ON CYPAK INSTALLATIONS IN THE FORD MOTOR COMPANY*

by R. W. Kowitz
Design and Standards Department
Manufacturing Engineering Office
FORD MOTOR COMPANY
Dearborn, Michigan

ANY NEW ELECTRICAL DEVICE for which positive operation and reduced maintenance is claimed always creates an interest among electrical engineers at the Ford Motor Company. Consequently, when I reported to the Electrical Standards Committee of the Ford Motor Company on the proceedings of the 1955 Machine Tool Forum that Westinghouse was in the process of developing a static system to replace relays and thereby eliminate the associated maintenance and downtime, the interest was great and the reaction almost immediate.

Within two weeks after the Forum, a group of Westinghouse engineers visited the Ford Motor Company to demonstrate a Cypak unit and to point out that it operates at very low power levels and that no moving contacts are involved.

To date, we have two different operations using Cypak controls. They are an open back, inclined, 75-ton Ferracute press and two Springfield Company grinders which finish grind the hub of the converter impeller assembly for the automatic transmission.

The Ferracute press was shipped to the Manufacturing Development Building of our company in order that the Cypak press control could be carefully observed by engineering and laboratory technicians during operation.

The function of the Cypak system on this press is to energize and de-energize the clutch solenoid air valve. This is done in conjunction with a rotary cam switch to provide the usual safety interlocks found on presses. The cam limit switch is adjusted so that the operator must keep two separate pushbuttons depressed until the dies have nearly closed; he must then release both buttons to reset the anti-repeat circuit. An inching circuit is also provided which bypasses the Cypak and operates the clutch solenoid valve. The press was arranged to cycle automatically without dies or load other than the ram.

After some 68,000 cycles one of the small isolating rectifiers on the input of a memory board failed. It is significant to mention at this point that the Cypak system did fail safe, in that when the failure occurred the press returned to full open position and then stopped. The memory board was replaced and the press was again put back in operation and allowed to cycle continuously until 633,000 cycles had been registered. At this time it was decided to replace the direct-operated solenoid air valve, which required 2300 volt-amperes inrush, with a pilot-operated solenoid valve requiring approximately 200 volt-amperes inrush. This was done to enable the Cypak system to control the valve solenoid directly without the use of an intermediate relay. Eliminating the relay reduced the over-all time of sequence by about one-sixtieth of a second. To date, a total of 700,000 cycles has been

Also see "The Editor Reports on Cypak Systems," Tooling & Production, June, 1955, p. 71.

*Presented at the 20th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation.

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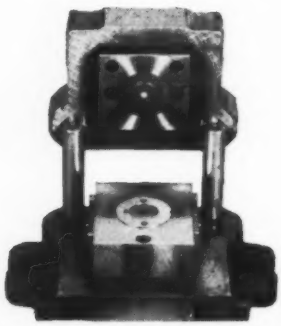

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reached with no electrical trouble other than the one rectifier failure. This is approximately 7% of the normal life expectancy of a relay. We expect to continue this test.

Now let us look at the two Springfield grinders. These grinders are identical in operation and are being used on a production application. This Cypak control is considerably more complicated and extensive than the press control previously described. While there are no conventional control relays, each of the eight Cypak circuits feeds a preamplifier which controls a single pole, heavy duty, midget relay. The relay, in turn, controls the solenoid of a hydraulic valve. This may have been done to conserve space and reduce cost since it does eliminate the need for large power amplifiers and associated equipment. The coil of the midget relay requires only about 40 milliamperes at 115 volts a-c for normal operation.

The hydraulic pump motor and the spindle motor are controlled by standard motor starters and pushbuttons. Other controls, such as pushbuttons, limit switches and pressure switches, are conventional oiltight, industrial types. Selector switches allow for either manual or automatic operation of the various functions of the machine. Since the machine has two stations which are entirely independent, all controls are duplicated for the second station.

In the actual sequence of these grinding machines as controlled by the Cypak system, the operator places the part on the chuck and presses the cycle start button to initiate the Cypak control and start the machine through its automatic sequence. Solenoid operated hydraulic valves actuate cylinders which clamp the part and bring the sizing device into position. The part starts to rotate as the wheel is advanced to the work. The feed cycle now begins and the coolant is applied to the workpiece. When the sizing device indicates the part is finished to size, the feed solenoid is de-energized, the head retracted, and the coolant shut off.

In addition to the normal sequence of operations, the Cypak system can compensate for wheel wear automatically on each cycle. However, the compensation is only necessary periodically. Wheel dressing can likewise be controlled either manually or automatically.

No trouble whatever has been reported on the Cypak controls even though the two grinding machines are located in different plants, are operated by different personnel, and have been in operation about five months. This fact alone has made a favorable impression on both engineering and maintenance personnel to the extent that we are now considering other applications.

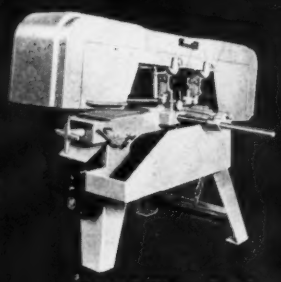
Since there are no moving contacts in the logic system, it is obvious that the Cypak control is more suitable than relays for applications which are highly repetitive.

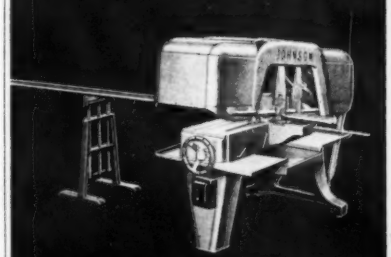
To date, maintenance on the control has been no problem and we hope that it will continue to be so. However, we are looking to Westinghouse to make instruments available to distinguish between the phi and theta voltages used, and for simplified instructions for locating troubles that may arise. Although no repairs are possible to the individual boards, replacement of them is a simple matter once the trouble is located.

As stated at the outset, Ford engineers are always interested in any device which requires little or no maintenance, especially when it replaces one requiring considerable attention.

To this extent, we are looking forward to further developments in static-type controls applied to devices outside of the control panel which will supplement the Cypak system. One of the main sources of trouble is limit switches. Both

Model J (Heavy-Duty) Wet or Dry models. Easily handles 10" rounds, 18" flats.


Model B (Wet or Dry) For precise cut-off of 5" rounds, 10" flats.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electrical contacts and mechanical component parts require frequent replacement on many applications, due to the severe requirements of production equipment. We are now testing a limit switch, which we have nicknamed the "proximity switch," since no physical contact with it is necessary for operation. When any magnetic material, such as a steel plate, is brought within ⅛" of the end of the switch, an inductive bridge connected to a magnetic amplifier actuates a small relay located in the control panel.

The pickup head is completely sealed against contamination. No contacts are involved and no mechanical action takes place.

Such static controls used in conjunction with Cypak systems should contribute toward uninterrupted output from high production machine tools and other industrial equipment.

On April 20, Dreis & Krump Mfg. Co. completed and shipped its 100,000th hand bending brake. The Chicago company builds hand bending and power press brakes.

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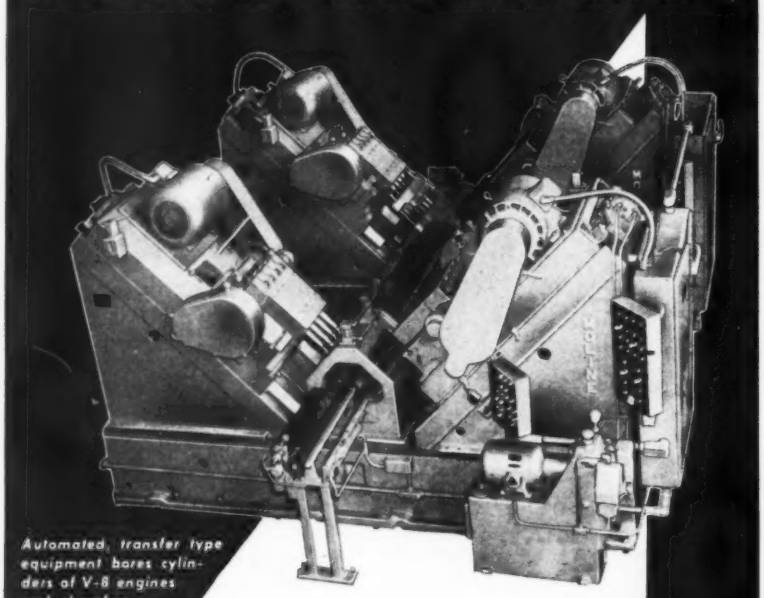

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"Commendable Comments"

"Every business needs sound and realistic replacement policies and procedures to assist its management in getting the most out of its capital expenditures. Few companies can afford the luxury of not investigating the possibilities inherent in a good replacement or modernization program."

—By Earl P. Leeds, assistant general sales manager of Brown & Sharpe, at the 54th anniversary meeting of the New York-New Jersey Branch of the National Metal Trades Association.

"To the researcher himself a negative result is often as valuable as a positive one. Unfortunately, however, it is very difficult to translate negative results into company profits that favorably influence a board of directors."

—By Dr. Roger H. Lueck, vice president in charge of research of American Can Company, at an American Management Association seminar.

"The theory that because you make more per hour, the cost must be less, is completely in error.... Too often the first operation is sped up to the point where the quality is impaired and the additional operations, such as burring and sizing, are added whereas the cost would have been less if the part were properly run at a slower speed."

—By Ernest W. Schneider, president of the National Screw Machine Products Association, at an ASTE Conference at the University of Illinois.

"The automotive engineering field is, indeed, so broad that no one person could claim to be master of it. The best that the individual can do is to have the right ingredients from each of the engineering fields to get his present project done."

—Charles A. Chayne, vice president in charge of Engineering Staff, General Motors Corporation, at an SAE Meeting at Technical Center.

"If we, as the business group in America, are ever to be successful in exercising leadership that is effective, we must first of all direct our attention to the parts, not to the whole. We must direct our attention to the people with whom we are each in contact."

—Harold Brayman, director of public relations, E. I. du Pont de Nemours & Company, in a panel discussion before the Washington, D. C., Chamber of Commerce.

"... the development of ... the isotope program will require Industry to completely revise processing techniques, and utilize new and now nonexisting equipment, thus offering equipment manufacturers an opportunity to design and market a new line of radiation producing equipment."

—By C. W. Wallhausen, vice president of U.S. Radium Corp.

GROWING PAINS

Clipper Diamond Tool Company, Inc. has moved to larger quarters on Hudson St. in New York City, which provides three times more area. The firm produces diamond dressers; boring tools; tungsten carbide impregnated tools; and resin, metal, and vitreous bonded diamond wheels.

◆

The construction of a plant for **Automatic Switch Company** is now underway in Florham Park, N. J. These facilities will double the capacity of the ASCO plant located in Orange, N. J. The company which is a leading designer and manufacturer of solenoid valves and electromagnetic control, will move its entire operations to the new location by the end of the year.

◆

The Ohio Knife Company has opened a new branch office in Pittsburgh. James Gillis will be in charge of this office, assisted by Arthur Doud, Jr. Ohio Knife products include industrial knives, wear plates, dies, ways, and shear blades.

◆

Square D Company will build an electrical equipment assembly plant in Atlanta, Ga. The 31,000-sq-ft structure will house the company's regional headquarters offices now located in Atlanta, as well as providing production facilities. The new factory will serve as a base of expanded operations in southeast United States for Square D which manufactures electrical distribution and control devices.

◆

Sterling Die Division, **Pratt & Whitney Company, Inc.,** will occupy a new plant in Southwest Industrial Park, Cleveland, in October. This factory which will house expanded manufacturing operations and administrative offices, will more than triple Sterling Die Division's facilities for producing thread rolling dies.

◆

Wausau Iron Works has disclosed an expansion and modernization program which will provide 100,000 sq ft of manufacturing facilities. The plan provides for re-alignment of manufacturing facilities in line with modern equipment for material, storage, handling, preparation, assembly, and finishing of products.

American Can Company has announced plans for the installation of Detroit's first facilities for the manufacture of beverage cans. This plant will have an annual rated production capacity of 160-million containers. The company has also broken ground for a can-making factory in Blue Ash, O., marking the start of its 61st container manufacturing plant in the United States, Canada, and Hawaii. The capacity of this facility will be 250-million cans a year. The new factory will be completed early next year.

A $23,000,000 expansion and modernization program covering the next five years has been announced by the Medium Steam Turbine, Generator, and Gear Department of **General Electric Company.** The plan calls for new buildings, equipment, and manufacturing methods. The company is also planning to build a plant in Lynchburg, Va., to house its Rectifier Department. The building which will be completed next year, will provide more than 250,000 sq ft of office, manufacturing, and laboratory space.

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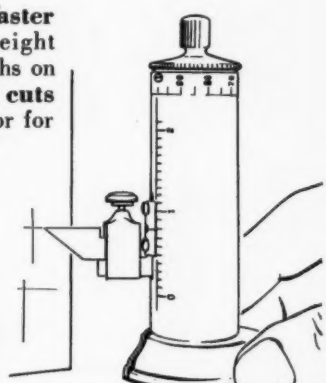
Precision-built Micro-Height reads **faster than your micrometer!** It measures height direct from **zero at base** to 3". Hundredths on barrel... thousandths on large head that **cuts reading time!** Attach your dial indicator for quick measuring between holes, surfaces!



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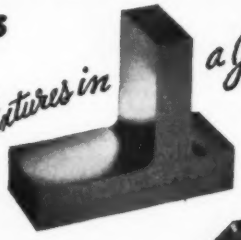
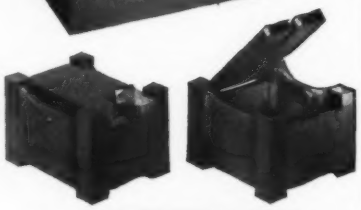
"T" ANGLE PLATES

Fixtures in a Jiffy!



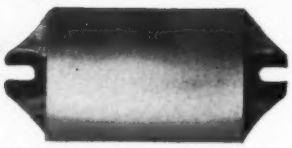
Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized and precision machine castings. Full scale sheets of 7 standard sizes will be included with your catalog if requested.

BOX JIGS



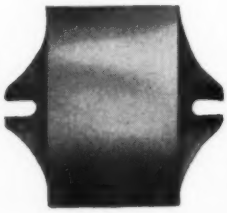
Box Jigs shown are made in either square or rectangular style in 9 sizes. Have them on hand in several sizes, use them, and watch your profits mount.

MILL FIXTURE BASES



The Mill Fixture Base shown on top is available in four sizes, the Gang Mill Fixture Base in three. Both are furnished with either standard keyways or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost. These normalized bases are precision ground, parallel top and bottom with one side finished parallel to the keyways, eliminating the delay and expense necessary in obtaining patterns, castings, normalizing and machining. Ask for full scale template drawings in your size range.

Sure Lock Fixture Keys See Page 41 of our Template Catalog



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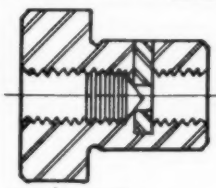

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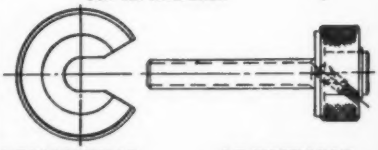

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4	25	44	89	111	130	1041	1416	1474	1523	1574	1612
5	26	45	90	112	131	1171	1421	1481	1531	1581	1613
6	27	47	91	113	132	1172	1422	1482	1532	1582	1621
7	28	48	92	114	133	1173	1431	1483	1533	1583	1622
9	29	49	93	115	165	1381	1432	1491	1534	1584	1623
10	30	53	94	116	166	1382	1433	1492	1541	1585	1631
11	31	54	95	118	841	1383	1434	1493	1542	1591	1632
12	32	56	96	119	842	1391	1441	1494	1543	1592	1633
13	33	57	97	120	843	1392	1442	1501	1551	1593	1641
14	34	77	98	121	991	1393	1451	1502	1552	1594	1642
15	35	78	101	122	992	1394	1452	1503	1553	1595	1643
16	36	80	103	123	1001	1401	1453	1504	1561	1596	
17	37	81	105	124	1002	1402	1461	1511	1562	1597	
18	38	82	106	125	1003	1411	1462	1512	1563	1601	
19	39	83	107	126	1021	1412	1463	1513	1564	1602	

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A1	A19	A37	B4	B22	B40	B58	B76	B94	C10
A2	A20	A38	B5	B23	B41	B59	B77	B95	C11
A3	A21	A39	B6	B24	B42	B60	B78	B96	C12
A4	A22	A40	B7	B25	B43	B61	B79	B97	C13
A5	A23	A41	B8	B26	B44	B62	B80	B98	C14
A6	A24	A42	B9	B27	B45	B63	B81	B99	C15
A7	A25	A43	B10	B28	B46	B64	B82	B100	D1
A8	A26	A44	B11	B29	B47	B65	B83	B101	D2
A9	A27	A45	B12	B30	B48	B66	B84	B102	D3
A10	A28	A46	B13	B31	B49	B67	B85	C1	
A11	A29	A47	B14	B32	B50	B68	B86	C2	
A12	A30	A48	B15	B33	B51	B69	B87	C3	
A13	A31	A49	B16	B34	B52	B70	B88	C4	
A14	A32	A50	B17	B35	B53	B71	B89	C5	
A15	A33	A51	B18	B36	B54	B72	B90	C6	
A16	A34	B1	B19	B37	B55	B73	B91	C7	
A17	A35	B2	B20	B38	B56	B74	B92	C8	
A18	A36	B3	B21	B39	B57	B75	B93	C9	

Which article in this issue was of most interest to you? _____

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A5	A23	A41	B8	B26	B44	B62	B80	B98	C14
A6	A24	A42	B9	B27	B45	B63	B81	B99	C15
A7	A25	A43	B10	B28	B46	B64	B82	B100	D1
A8	A26	A44	B11	B29	B47	B65	B83	B101	D2
A9	A27	A45	B12	B30	B48	B66	B84	B102	D3
A10	A28	A46	B13	B31	B49	B67	B85	C1	
A11	A29	A47	B14	B32	B50	B68	B86	C2	
A12	A30	A48	B15	B33	B51	B69	B87	C3	
A13	A31	A49	B16	B34	B52	B70	B88	C4	
A14	A32	A50	B17	B35	B53	B71	B89	C5	
A15	A33	A51	B18	B36	B54	B72	B90	C6	
A16	A34	B1	B19	B37	B55	B73	B91	C7	
A17	A35	B2	B20	B38	B56	B74	B92	C8	
A18	A36	B3	B21	B39	B57	B75	B93	C9	

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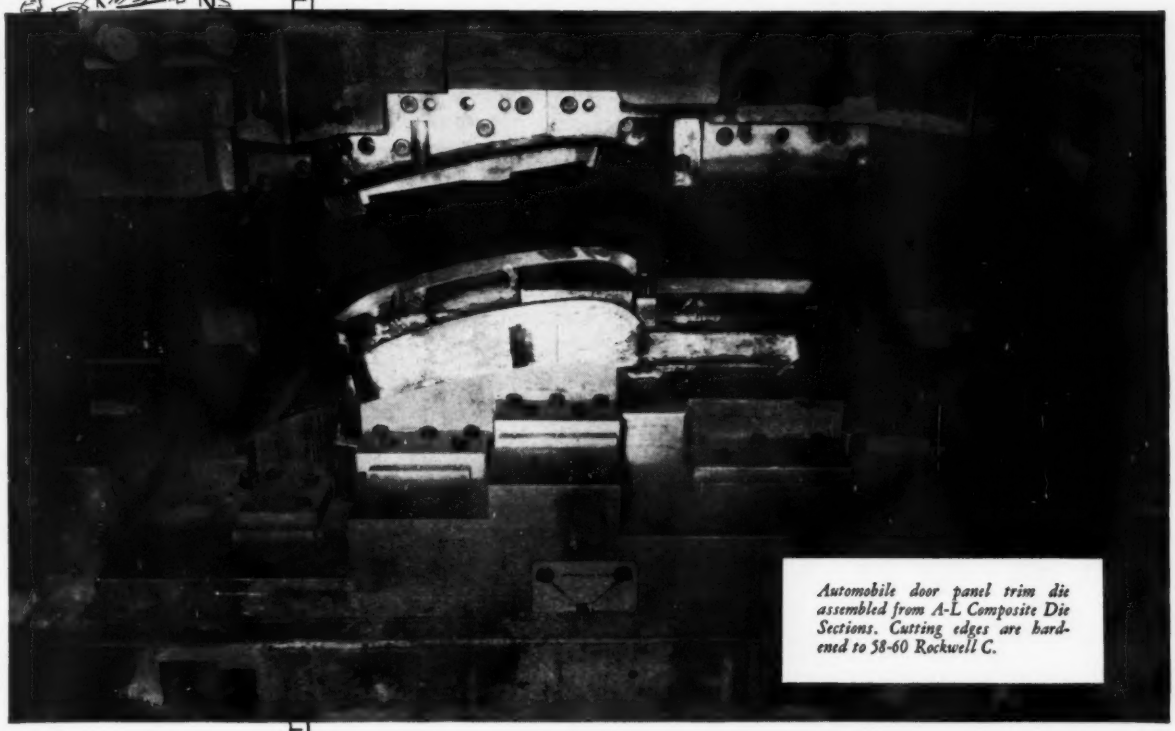

Automobile door panel trim die assembled from A-L Composite Die Sections. Cutting edges are hardened to 58-60 Rockwell C.

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Contains the latest information on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties that can save you time and money . . . also Composite Die Sections and Smooth Hammered Forgings in a wide range of tool and stainless steels. *Don't wait—get your copy NOW.*

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Dies can be assembled from A-L Composite Die Sections to blank, trim, bead or do any job requiring the cutting of sheet metal to regular or irregular shapes. Thousands of die shapes are possible from combinations of the thirty-five standard sections carried in stock. Thus, you save the time and trouble of machining custom-made sections from solid stock and minimize the waste of valuable tool steel.

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Ask your Allegheny Ludlum representative about this money-saving method of die making . . . or write *Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Aves., Detroit 20, Mich.*

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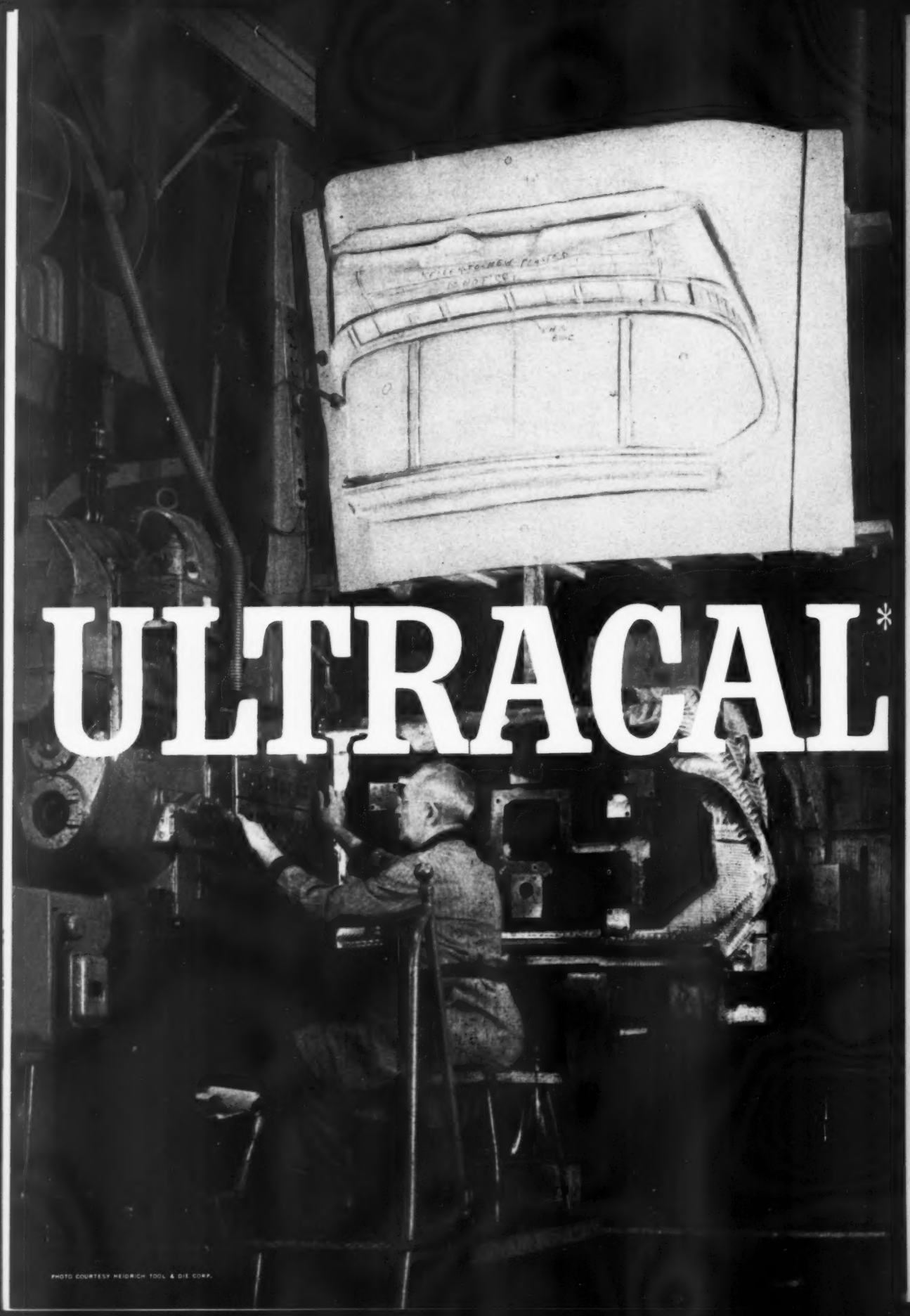
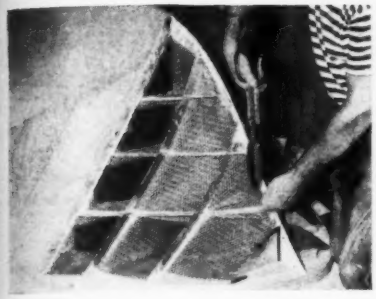


ULTRACAL*

PHOTO COURTESY HEIDRICH TOOL & DIE CORP.

HOW PLANS TAKE SHAPE WITH ULTRACAL GYPSUM CEMENT



In fabrication of this plastic boat model, expanded metal to support the gypsum cement is placed between templates, erected on a laminated plywood base. The surface is built up by placing fiber bats saturated with ULTRACAL gypsum cement over the metal.

The final mix of gypsum cement is screeded or splined in with a metal screed to provide contour for the boat hull. The ease with which ULTRACAL gypsum cement can be applied simplifies the fabrication of patterns and models in virtually every industry.

PHOTOS COURTESY WINNER MFG. CO.

The completed ULTRACAL gypsum cement model is inspected for accuracy and contour. This model was completed in two to three weeks total time as compared with the two or three months required for a mahogany model to serve the same purpose.

to carry out plans from drawing board to master pattern quickly, economically, accurately

Progressive tool and die shops and pattern-making firms are using HYDROCAL* and ULTRACAL* gypsum cements for quick, low-cost duplicator patterns. Industry has found that it can simplify model making, save time, and reduce pattern and model-making man-hours as much as one-third to one-half over traditional wood carving techniques, common today in so many plants.

Gypsum cements mix to a smooth slurry for pouring simple designs or for splash casting large duplicator patterns mounted on the Keller machine as shown. HYDROCAL and ULTRACAL are characterized by high strength, extreme surface hardness, unparalleled surface smoothness, with dimensional stability and accuracy unaffected by varying temperatures and humidity.

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UNITED STATES GYPSUM

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In conjunction with a standard shear, this new Union Shear Line gives fully automatic performance. Pieces can be sheared at the rate of 943/hr, from 28-ga coiled steel.

The unit features an air-operated clutch, and a manually operated handwheel for cut-to-length adjustments. Shearing can be held to commercial tolerances.

This new shear line is being produced by the Union Tool Corporation, 829 N. Detroit St., Warsaw, Indiana.

ROTARY SWAGING

eliminates waste and scrap

A Torrington Rotary Swaging Machine shapes work instead of cutting metal away, eliminating waste and scrap—cutting processing time as well.

This part was originally turned from a solid brass bar weighing 3 pounds. Cutting cycle was 86 seconds. When swaged from tubing, stock weight was reduced 83%. Swaging of tube and assembling the head took a total of 12 seconds.

If your operations include reducing, tapering, pointing, sizing, bonding, forming inside contours or threads—swaging can save you time, money and material.

Write today for our informative booklet on Torrington Rotary Swaging Machines. Or ask to have a technical representative call to show you how rotary swaging can achieve new savings in your plant.

THE TORRINGTON COMPANY
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Advantages of Rotary Swaging—

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2 Savings in labor—swaging can be done by unskilled labor.

3 Improved products—swaging improves grain structure, tensile strength, resiliency and finish. Produces work accurate to ± .001" and better.

Write for new catalog—It describes swaging benefits, covers selection of a swager, and gives specifications of Torrington's new streamlined Rotary Swaging Machines. Ask, too, to see our new motion picture on swaging.

90th ANNIVERSARY 1865-1955

TORRINGTON ROTARY SWAGING MACHINES

Makers of Torrington Needle Bearings

CIRCLE INFORM-A-GRAM KEY NO. 88

Will You Be There?

July 16-21. American Standards Association. International Organization for Standardization Council Meeting. Geneva, Switzerland.

July 16-17. National Association of Scale Manufacturers, Inc. Annual Meeting.

July 23. Truck-Trailer Manufacturers Association. Annual Summer Meeting. Edgewater Beach Hotel, Chicago.

Aug. 6-17. American Society for Quality Control, U.C.L.A. Department of Engineering, University Extension. Course: "Statistical Methods in Industry." University of California, Los Angeles.

Aug. 7-8. National Screw Machine Products Association. Second Annual National Sales Conference. Wade Park Manor Hotel, Cleveland.

BALDWIN ANGULAR POSITION ENCODERS

A comprehensive 8-page bulletin describing the new Baldwin 13-digit and 16-digit optical-type analog to digital angular position encoders, has been published by the Electronics Division of The Baldwin Piano Company, 1881 Gilbert Ave., Cincinnati 2, Ohio.

Well illustrated, the bulletin gives detailed information on the operation and construction of the two models and describes the manufacture of Baldwin binary and other type code disks. Encoder and code disk specifications are included.

Copies of the bulletin may be obtained by writing the manufacturer, attention of John E. Rotte, Chief Liaison Engineer, or

Circle Inform-A-Gram No. D1.

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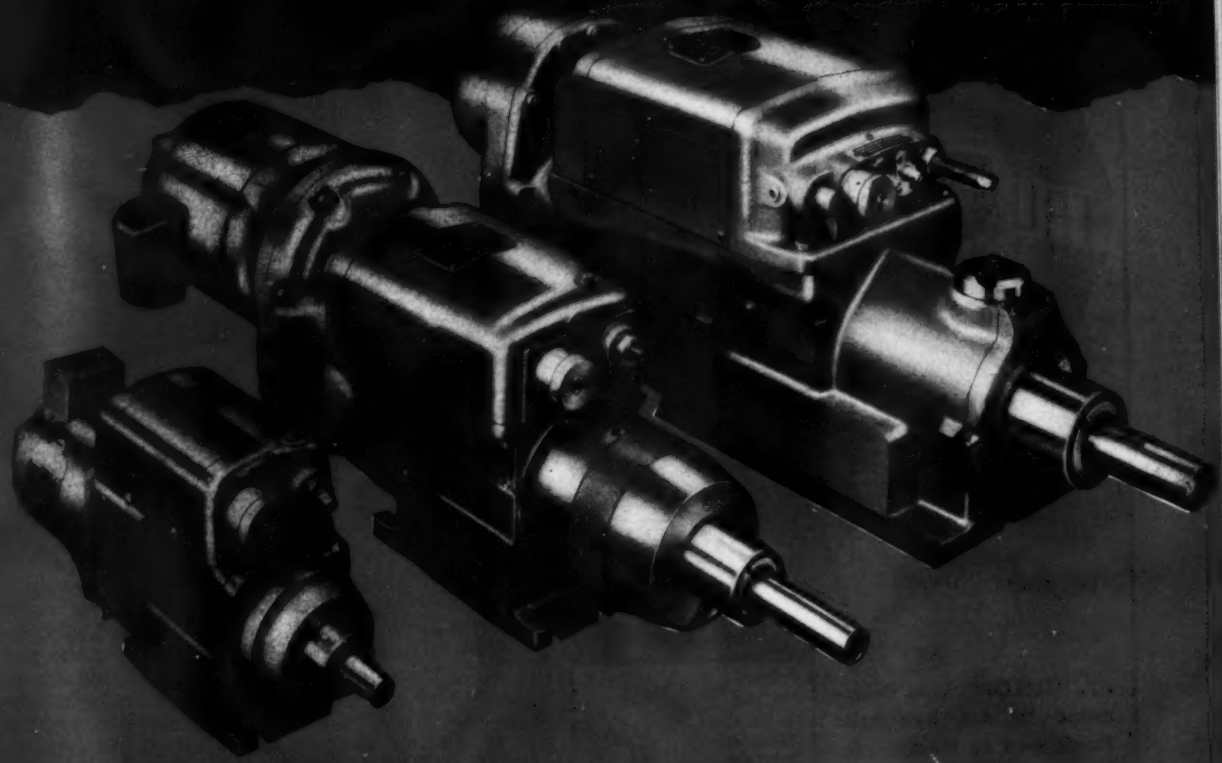
COMPLETE DRILL UNIT LINE!



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Model No.	Drilling Capacity Mild Steel	Tapping Capacity Steel	Maximum Stroke	Horse Power	Spindle Speed Range	Feed Range	Rapid Approach Rate	Rapid Return Rate	Standard* Spindle Nose
19-150	5/16" dia.	3/8"	1½"	⅓ to ¾	300 rpm to 10,000 rpm	0-70 ipm	350 ipm	300 ipm	#2 Jacobs external taper
19-400	3/8" dia.	5/8"	4"	¾ to 2	100 rpm to 5,000 rpm	0-50 ipm	300 ipm	240 ipm	#2 Morse internal taper
19-600	1¼" dia.	1"	6"	1½ to 5	28 rpm to 3,450 rpm	0-180 ipm	Adj. to 300 ipm	Adj. to 240 ipm	#4 Morse internal taper

* Special spindles available on request.

If in your plant you drill, tap, ream, spot-face, center, hollow mill, chamfer or counter-sink and you want to cut costs, send for this catalog . . .

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THE HARTFORD SPECIAL MACHINERY CO.
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☐ Have Field Engineer call.
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TRU-O-SEAL
TEFLON SEAL

Does away with messy pipe "dope" compounds!

PAT. PENDING

. . . Eliminates valve and pump damage caused by overtightening of leaky joints.

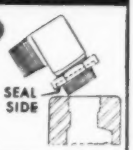
. . . "TEFLON" SEAL is immune to ALL hydraulic fluids and to steam, air, water, solvents and practically all gases and chemicals!

. . . Withstands temperatures from —100° F. to plus 500° F.!

. . . Fully field tested and proven by leading manufacturers!

EASY INSTALLATION!

1 Thread TRU-O-SEAL on pipe or fitting (no messy pipe "dope" needed).



2 Thread pipe or fitting 4 threads into port. Point in desired direction.

3 Tighten TRU-O-SEAL to complete leakproof assembly (only light torque required).

TRU-O-SEAL stops present pipe thread leaks instantly, prevents future leaks, saves cost and labor of special or welded fittings. For 3000 psi operation (15,000 psi minimum proof pressure). Comes in ⅛" to 2½" pipe thread sizes.

Write for Prices and Complete Data

TRU-O-SEAL DIVISION
Flick-Reedy Corporation

2046 N. Hawthorne Ave. Melrose Park, Ill.

"Miller Fluid Power" is also a division of Flick-Reedy Corp.

CIRCLE INFORM-A-GRAM KEY NO. 90

Standard Machine Components Make up Transfer Machine

Production machining and handling of camshafts are being facilitated by one of the major automobile companies with a special 12-station transfer machine built around standard machine components. These units, built by the Michigan Drill Head Company, Detroit 34, as well as the transfer, locating and clamping mechanisms are hydraulically operated and electrically controlled.

When the camshaft comes to the machine, the bearings and journal have been rough turned, the ends faced and centered, and the sides of the front bearing faced. As the part progresses through the machine, it rides on the two end bearings and is guided on both sides of the front bearing. It is pushed by two fingers which bear on the camshaft between the lobes. The part is fed into the machine from a magazine by an automatic loading device.

When the part is placed in position by the loading device, it operates limit switches which start the transfer cycle. As the part is being transferred, various rails control its position by interfering with the cam lobes in such a manner as to prevent the camshaft from rolling.

When the part reaches station No. 2, it is clamped for position on centers and radially located by means of a hydraulically operated vee on the No. 1 intake cam lobe. When the part is clamped, the transfer bar returns and the hydraulically operated machining units start forward.

From station No. 2 through station No. 10, various sized holes are drilled, reamed and tapped in horizontal and vertical positions and a keyway cut.

At station No. 11 rubber pads cover three holes (which had been drilled at stations No. 9 and No. 10) and air blown through them. If a hole has not been drilled to depth no air passes, causing a pressure to build up which, through a pressure switch, will stop the machine.

At station No. 12 the part is unloaded onto a conveyor.

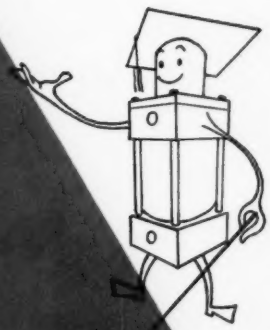
The standard components are right and left hand, vertical and horizontal, single and multiple spindle, hydraulic machine units.

Miller

FLUID PRESSURE BOOSTERS

- Save space, weight and investment cost by replacing pump installations in many applications
- Less costly to install, operate and maintain
- Hold pressure indefinitely without the motion and heat generation of ordinary pump circuits
- Provide — at point of cylinder thrust — more efficient power with less weight in less space than direct driven air cylinders
- Save up to 95% of air consumed by direct driven air cylinders
- Operate at speeds of 30 to 450 strokes per minute

NOTE: In addition to its most complete line of "Custom-Built" Boosters available on normal delivery, Miller offers 5" bore 25 to 1 ratio, boosters for immediate delivery in either 6" or 12" stroke. Write for data and prices.



ESPECIALLY RECOMMENDED FOR

- **WELDING**
- **PUNCHING**
- **SHEARING**
- **CLAMPING**
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- **CRIMPING**
- **PRESSING**

and similar applications

FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST
Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

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Miller

MILLER FLUID POWER DIVISION
FLICK-REEDY CO.

2046 N. Hawthorne Ave., Melrose Park, Ill.

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ONE COMPLETE REFERENCE FOR YOUR ONE SOURCE OF DIE-SET ACCESSORIES

More than 200 pages featuring the all-new "LEADERSHIP LINE"

Danly's new "Leadership Line" of die sets and diemaker's supplies is a major development in the stamping industry — certain to affect every toolroom and die shop in the country.

That's why Danly's new catalog is a must for every tool engineer's technical library . . . specially edited and arranged to present complete dimensional data. Easy-to-read tables . . . convenient product illustrations and drawings . . . clear indications of all optional features make it a real working tool. Includes all Danly Die-Sets, Die-Set Accessories, Diemakers' Supplies, Bolster Plates and Bolster Accessories making up Danly's all new "Leadership Line". Easy to look at — and easy to get . . .

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2100 South Laramie Avenue, Dept. E Chicago 50, Illinois

At Your SERVICE

Light, medium and heavy metalworking machinery maintenance and rebuilding is a contract specialty of Jones Machine Tool Works, Inc., of King of Prussia, Pa.

Precision stampings of 1075 or 1095 carbon spring steels, spring brass, phosphorous bronze, aluminum, beryllium copper or stainless steel can be obtained from California Spring Co. of Los Angeles. The springs are used in aircraft, guided missiles and electronic equipment as well as general industrial and consumer products.

All makes, sizes and types of band files can be sharpened and repaired at the National File Co. of Lansing, Mich.

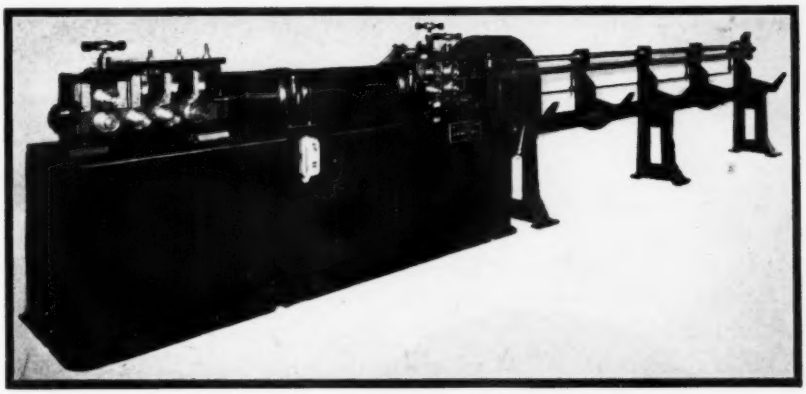
The Risdon Manufacturing Co. points, forms, stamps and finishes products and components made from .015" to .250" dia wire in its Naugatuck, Conn., plant.

Lapping no longer need be reserved for a handful of special parts. The production lapping service available from J. B. Maris Company, Bloomfield, N. J., assures flatness, surface finish, parallelism or combined characteristics for all metals, plastics, ceramics, etc.

To help answer the growing demand for vacuum heat treating capacity, National Research Corp. has installed a vacuum annealing furnace with a hot zone 36" dia and 36" high at its Newton, Mass., plant. It has a maximum working temperature of 2000° F and minimum pressure of 0.5 microns. Heat treating in a vacuum furnace is recommended for many high performance metals and alloys, particularly reactive metals such as titanium and zirconium.

Quality control engineers and supervisors from 14 General Electric plants east of the Mississippi and north of the Ohio Rivers, attended a one-day gage clinic at The Sheffield Corp. in Dayton on April 24. The theme of the clinic was Future Gaging Techniques. The developments within Sheffield's autometrology laboratory and the application of the company's controls for the single or multiple combination of automatic machining, motion, memory, and measurement were previewed.

CONTROL IS THE GOOD WORD from SHUSTER



Dual Control 4AV — Straightens and Cuts 3/8" to 11/16" diameter basic wire. Geared to feed 90 to 180 feet per minute.

Individual Control of Speed and Cut Off

With the Dual Control 4 AV you can run at the most efficient speed for the characteristics of the wire being used. And you get a clean cut at any length. Send for details.

A COMPLETE LINE

Constant Speed Machines are available for straightening and cutting wire from .025" to 1/2"

Constant or Variable Speed Units with electrically controlled clutch and target are available from 1/16" to 1/2"

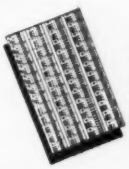
Other variable speed machines may be furnished to straighten and cut wire up to 11/16"

ALSO

Slide Feed Straighteners 3/8" x 10"; 9/16" x 10"
Feed Starters maximum 5/8" diameter

Tube and Bar Straighteners 7/32" to 5/8" bar; 1" tubing

Reels for coils up to 300 pounds



Send for free, wall-size, split-gauge wire chart, from 41 gauge to 7/0.

SHUSTER
Since 1866

METTLER MACHINE TOOL, Inc.
150 West Adeline St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 93

G. E. Plant has Numerous Modern Production Ideas

Numerous production innovations make it possible for General Electric to make in three 8-hr shifts the standard models of 7½ to 30-hp induction motors which formerly took two weeks to produce.

Standard models are manufactured in a straight-line flow on left and right assembly lines at the Schenectady, N. Y., plant, with special motors produced in a middle line which draws standard components from the other two. This expedites production of the "specials", which are basically hand-produced models.

The number of major hand operations is reduced to two at the plant. These involve stator winding and a portion of final motor assembly. All other operations are performed on machines which function automatically — most in a series of progressive machining.

Motor parts progress towards final assembly and testing along roller-type conveyors, with an overhead suspension system employed as needed for handling materials and for such operations as moving the wound stators through an automatic dip-and-bake processing.

Flexibility within the plant is enhanced by placing all machines except the largest punch presses on movable mounts.

A unique feature of the standard lines is an array of automatically-operated punch presses stationed at the beginning of both lines.

The punching operations are fully automatic — including feed of the sheet steel into the presses, movement of the punchings from blanking to indexing presses via magnetized conveyor belts, and removal of metal waste.

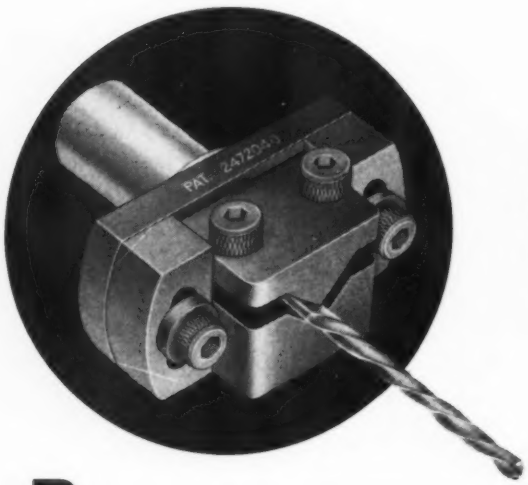
Scrap from the punchings is collected under the floor in an automatic operation conveying it to a chute which shakes the scrap into a large bucket. The cycle is concluded as the bucket fills to a preset load, when it automatically lifts to a position where the scrap is dumped into a collection truck outside the building. The bucket then returns again to its original position at the end of the chute. Shaking operation of the chute starts and stops at set intervals as part of the cycle.

All machining operations on 250-size frames are performed at a single machine where the feet are milled, footholes and conduit box holes drilled, shaft hole bored and rough-finished, and holes bored and tapped for the endshield bolts. These are completed in a progressive series of automatically controlled operations.

The motors are tested automatically on a circular platform at the end of each standard line. A previous production-line test for turn-to-turn failure, unbalanced resistance and high voltage is given at the point where the wound stators are prepared for the dip-and-bake processing. At regular intervals, fully assembled motors are selected for additional testing.

As they leave the final test platform, the motors are crated and raised by an automatic lift into a giant, slotted storage bank. As the boxes ahead are removed, the rest move forward on sloped roller conveyors.

The $7-million plant was designed to meet today's rapidly expanding motor market which is expected to increase at least 75%, industry-wide, by 1965.



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Patented features provide ease, speed, economy

Proved in four years of industrial use! Only the original Brookfield V-Jaw, adjustable tool holders provide these unmatched advantages:

- Drills, counterbores, reamers and cutters for almost any machining operation can be set up on the first try . . . without bushings or collets.
- Set-up time cut by 50% or more.

FREE! *Descriptive, illustrated brochure, plus prices and specifications.*

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West Coast Stocking Distributor:
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CIRCLE INFORM-A-GRAM KEY NO. 94

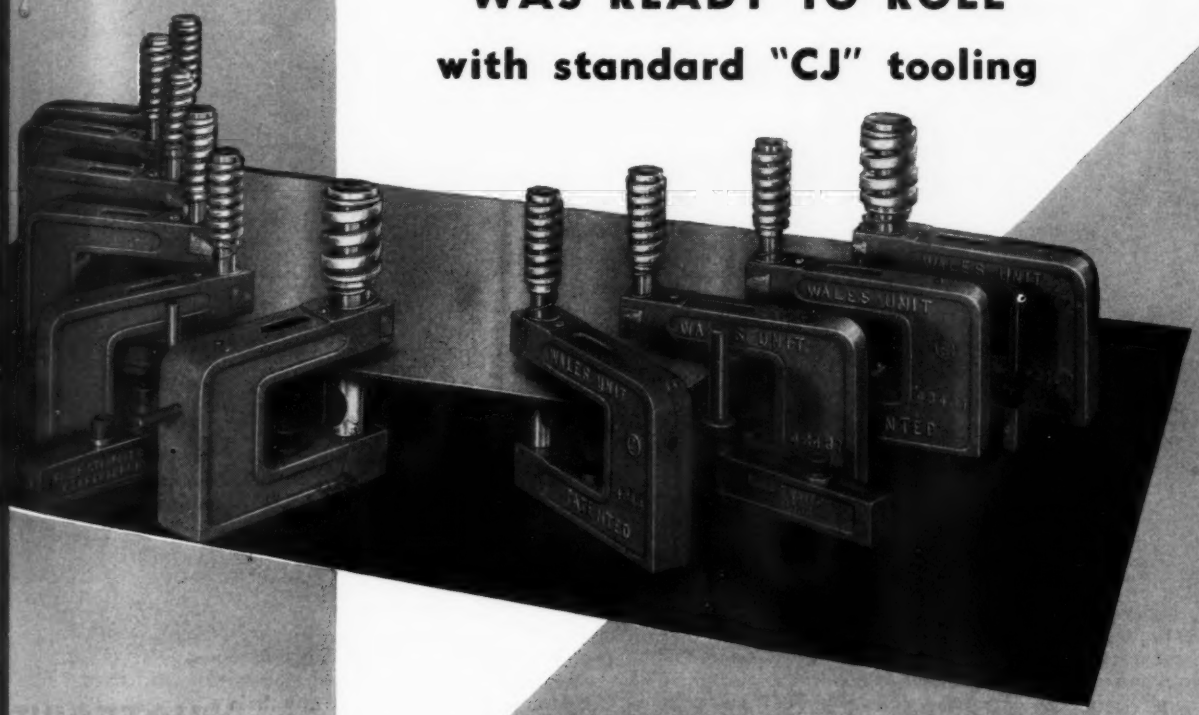
6 minutes . . . 45 seconds

and this ten hole

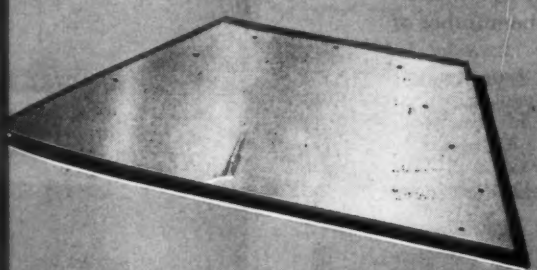
WALES PUNCH SET-UP

WAS READY TO ROLL

with standard "CJ" tooling



HERE'S THE RESULT EVERY 12 SECONDS



. . . and any good mechanic can make a similar set-up in a matter of minutes. WALES *standardized punching units* are completely self-contained . . . punches and dies are permanently aligned . . . nothing attached to press ram. They will always save hours . . . and often DAYS in set-up time.

Rugged type CJ units will punch holes up to 1¼" diameter in material up to ¼" thick . . . unlimited straight line, scattered and staggered, round or shaped hole punching patterns. Die retention design features rapid die change WITHOUT REMOVING DIE from set-up . . . provides controlled slug ejection.

No "dead storage" the WALES WAY! The same group of units can be used *over* and *over* again in other patterns.

Get this time-saving, money-saving story. Write for fully illustrated, fact filled catalog. NOW!

Send for BULLETIN NO. 11-F

Illustrated with actual job work and full of interesting data and suggestions that you can adapt for your shop.

WALES *Strippit* CORPORATION

"...the Wales-Way is the PLUS-PROFIT way"

345 PAYNE AVE. — North Tonawanda, N.Y.

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

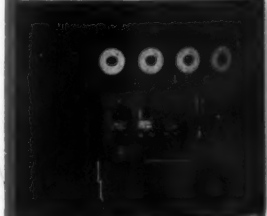
the *CLEARING ROBOT* that's setting records at HOTPOINT

Here's a Clearing high speed press that's making steel confetti fly at Hotpoint's Home Laundry plant in Chicago. Each piecepart has 5,000 perforations which are grouped in three different locations. The press operates at a speed range of 125 to 250 strokes per minute and "thinks" for itself in the matter of locating the hole groupings and the number of holes which is correct for each grouping.

The result is a finished part from which the cylinder of a dryer basket is made. It's a result that gives Hotpoint accurate parts, produced economically with a minimum of material handling.

If there is a place for one of "Speedy's" energetic and thoughtful brothers in your manufacturing plans, call on a Clearing sales engineer to talk the problem over.

Hotpoint dryer basket after it has been perforated and rolled into its cylindrical shape.



Part of the electronic brain that tells "Speedy" when to start and stop and where to locate the perforations.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION • *Division of U.S. INDUSTRIES, INC.*

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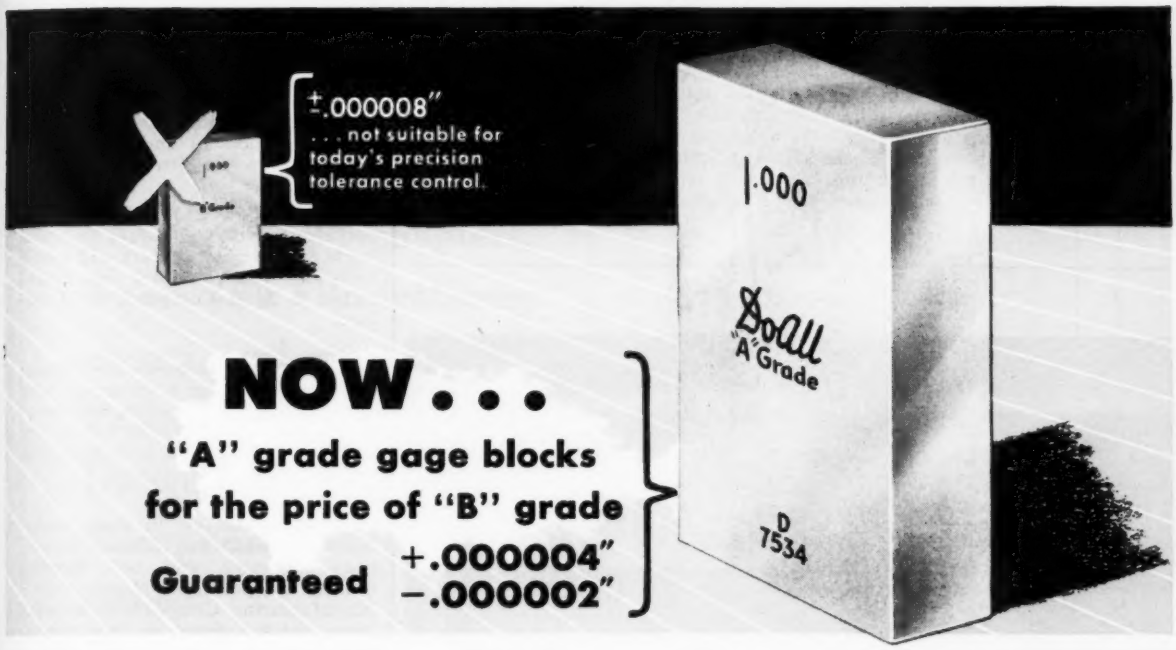
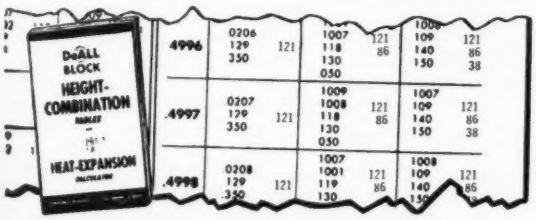
Why "B" Grade Gage Blocks Cannot Meet Today's Needs...



Here is Why: Consider .0001", a common part tolerance today. The checking gage must be accurate to .000010"—equal to or better than the accuracy of many gage blocks in common use! For example, a new one-inch gage block is acceptable as grade "B" if accurate to ± .000011", including observational errors. A single two-inch block could have a permissible error of ± .000020", amounting to 20% of the .0001" tolerance.

Such inaccuracies may be greatly multiplied when a stack of blocks is used. For example, in checking a shaft



dimension of 2.4977 (± .0001") a minimum of five blocks from an 86 piece set would be required. Assuming the most favorable combination—one two-inch block and four others—the stack *could* vary plus or minus .000064" (over a half-tenth). This is more than half the allowable tolerance of the part itself! If some of the individual blocks were plus and some minus, the total error would be less—but how much less?

When dealing with critical tolerances, "B" grade blocks just aren't adequate. Contrast them with DoALL "A" Grade Blocks *now available for the price of "B" Grade.*

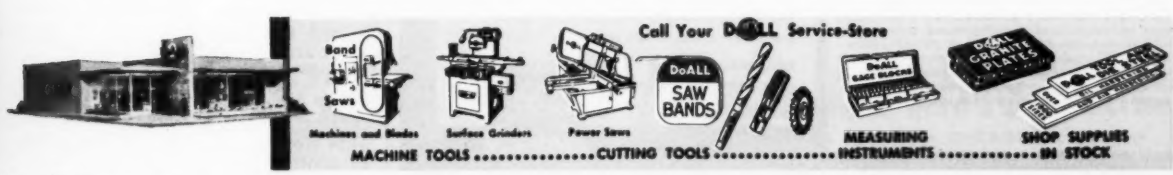
New DoALL "A" grade standards are plus .000004", minus .000002" maximum error per inch of length. Surface finish is guaranteed 0 to 0.09 RMS microinches, permitting calibration to within tenths of a millionth of exact size. Here is working accuracy you can rely upon —accuracy that eliminates need for calculating calibrated sizes, prevents errors, saves time and money. Why have less? Get the facts about DoALL's new gage block standards that meet today's needs. Remember, DoALL offers "A" Grade Gage Blocks at "B" grade prices.

Ask for Catalog—Call your local DoALL Store, or write

THE DoALL COMPANY

Des Plaines, Illinois

FREE — "How To Be Your Own Bureau of Standards" — tells how to inspect and calibrate gage blocks in your own shop. The only manual of its kind. Your copy free on request.



FRIENDLY DoALL STORES IN 38 CITIES give you personalized service and local delivery from complete stocks

CIRCLE INFORM-A-GRAM KEY NO. 97

38 Films on Work Simplification Listed in Folder

Thirty-eight films on the use of work simplification in industry are listed in a 12-page folder published by the Industrial Management Society. The folder is entitled, "Work Simplification on Film."

The terms by which the 16-mm color and sound films are available for rental are explained. These films produced by leading American companies, all have won awards in the annual Methods Improvement Competition sponsored by the Society. They picture "before" and "after" operations of work simplification projects, in both plant and office operations.

Copies of the folder are made available by the Industrial Management Society, 35 E. Wacker Dr., Chicago 1, or — **Circle No. D2.**

This Team Picks "T-P" to Cut Tool Room Costs

Purchasing . . . Production . . . Inspection — each rely on Taft-Peirce Tool Room Specialties to do an important job for their company. Better construction, more attention to details like heat-treating mean much longer life, greater *true value.* T-P precision craftsmanship in grinding, assembly, and inspection assures unfailing accuracy on every set-up . . . a better part, or final product. And basic construction is so sound that many of these products are reground after extensive use for even longer life-value.

Remember, to get that extra cost-trimming value . . .

T-P

Specify these Taft-Peirce Tool Room Specialties

(Top row, left to right) Angle irons, large stocks of several styles and sizes; V-Blocks, cast iron and steel for milling, planing, grinding and inspection; Box Parallels, sides parallel to within .00025" in 6", square to within .0005" in 6". (middle row) Cast iron surface plate with universal square and cylindrical square; Duplex bench block; Sine angle plate; 5" and 10" Sine Blocks. (lower row) Taper test fixture; Granite surface plate with 5" Sine Bar; and Comparator-Square with Cylindrical Squares.

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, R. I.

T-P Means TOP

Presenting . . . Representing . . .

B. C. Ames Co., Waltham, Mass., has appointed Korest-Peterson Co. of Grand Rapids, Mich., as distributor for the company's micrometer dial indicators and micrometer dial gages in western Michigan.

Floyd A. Fowler of Toledo is now northwestern Ohio representative for H & S industrial gears and speed reducers, manufactured by Horsburgh & Scott Company of Cleveland.

Rivett, Incorporated of Boston has appointed Cox Engineering and Sales Company as representative in the Detroit area for their line of air and hydraulic valves, cylinders, and power units.

Increased interest in shop equipment for measuring surface roughness, waviness, and ball bearing quality has prompted Micrometrical Manufacturing Company to appoint these eastern firms as representatives for the Profilometer, Wavometer and Anderometer: Walter J. Greenleaf Co., Pittsburgh, covering western Pennsylvania; C. E. Etzler Co., Drexel Hill, Pa., for eastern Pennsylvania and southern New Jersey; Harry R. Berkshire Co., Tenafly, N. J., for northern New Jersey, Long Island, and metropolitan New York; Anderson-Newton Sales Engineering, Rochester, for the rest of New York state; W. H. Gourlie Co., W. Hartford, covering Connecticut; and Sterling Sales, Inc., Worcester, covering all of New England except Connecticut.

The Frey Company, New York City, has been appointed eastern representative by the M. A. Ford Manufacturing Co. of Davenport, Iowa. The New York firm carries a stock of their rotary tools, carbide end mills, and Uniflute countersinks.

Reed Rolled Thread Die Co. of Worcester, Mass., has named Lee Horneyer Co., St. Louis, as a representative for their line of cylindrical die thread and form rolling machines, thread rolling dies, thread rolling attachments for screw machines, thread rolls and knurls, in eastern Missouri and southern Illinois.

The Nelco Tool Company of Manchester, Conn., manufacturer of carbide tipped tools, has appointed the F. Hallock Company, Derby, Conn., as New Haven area distributor.

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Fourth Edition

368 pages, 26 chapters, over 400 illustrations, charts and graphs. 165 Practical Points in Die Design and Construction. Comprehensively indexed.

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For VERSATILITY IN THE SHOP — ON THE JOB

cut it with the **WELLS 49-A**

As a Vertical Bandsaw

Here's real versatility in a Metal Cutting Bandsaw. The Wells 49-A is a dual purpose machine designed for shop or "job-site" work—economical to buy—economical to operate. Has 3" pipe capacity.

Use it as a horizontal cut-off saw to handle conduit cutting, bar stock or odd shapes. Swing the head into vertical position and the 49-A converts to an upright bandsaw for cutting angles, slots, notches, bevels and contour work.

The ½" blade is powered by a ¼ H.P. motor—other features include three selective speeds, positive vise action and automatic shut-off after each cut.

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Wells

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WELLS MANUFACTURING CORP.
1940 CEDAR ST., THREE RIVERS, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 991

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Low Cost... Compact... Powerful... Rugged

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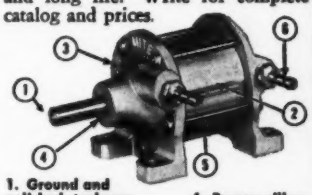

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4. Bronze oilless ram bushing
5. Five steel tie rods
6. Brass hose stems

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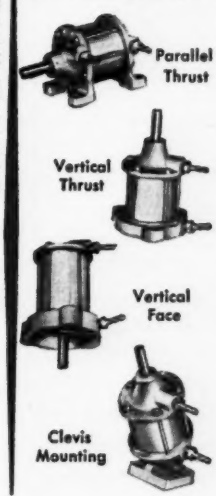

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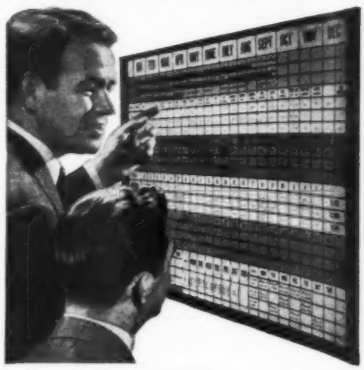

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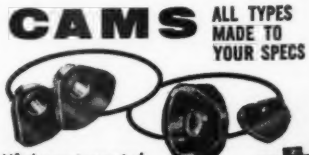

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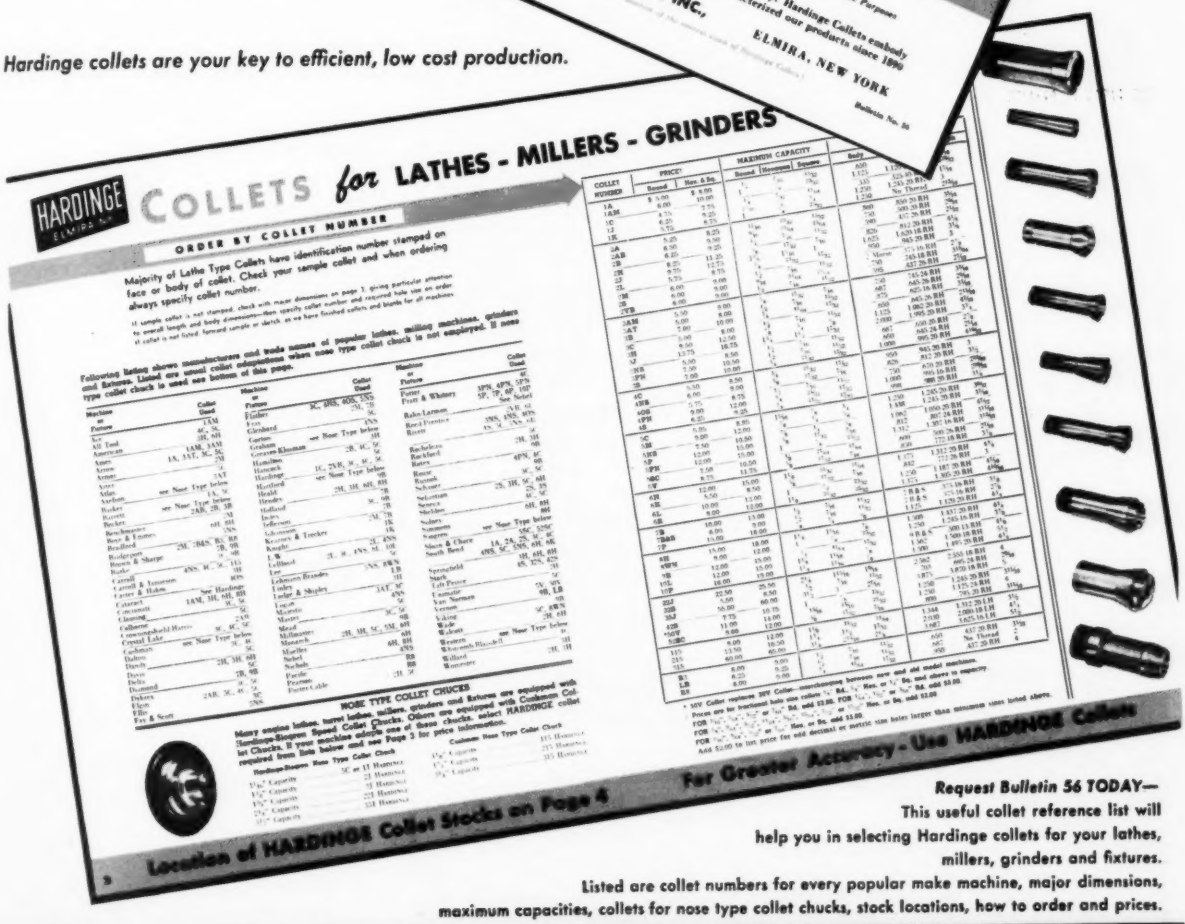
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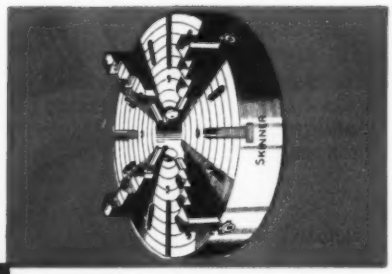

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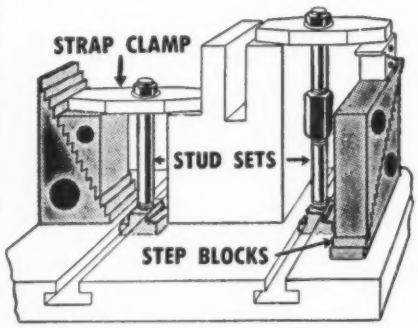

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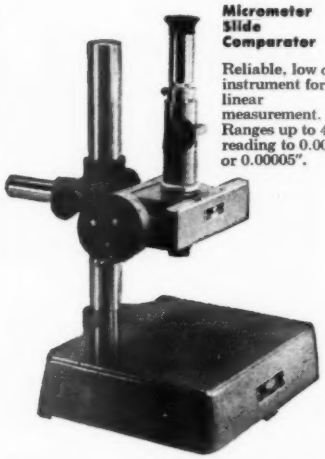

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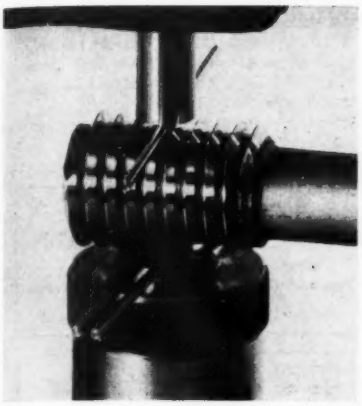

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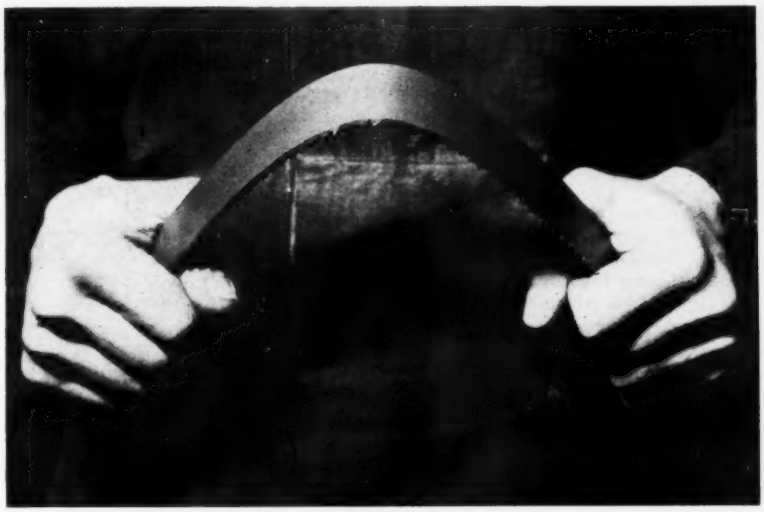
These leveling wedges have a cast slot which has to be finish machined to 1¾" deep and 4" long. An end mill has been found to be the best cutter to produce the required size finish cut.

Formerly, these slotting cuts were made with high speed steel cutters on a 10-hp Cincinnati Hydrotel, with the spindle speed set at 192 rpm and a table feed of 2 ipm. Under these conditions, they were able to get 4 cuts/grind.

After an investigation by B-L-H engineers, aimed at increasing production of this particular part, tests were made with "Helicarb" helical carbide end mills. "Helicarb" end mills, made by Sonnet Tool & Mfg. Company, Hawthorne, California, permitted the increase of spindle speed to 550 rpm and table feed to 8 ipm. They are now getting 160 slots/grind. Production of the finished part has also increased, with the "Helicarb" cutters reducing machine time 60%/part.

A test of high-speed steel and "Helicarb" cutters by B-L-H tool engineers, to determine the ultimate breakdown of the cutting edge of these two materials, resulted in a ratio of 40 to 1 in favor of the "Helicarb" cutters.

The cutter used in making the cut, shown in the illustration, is a "Helicarb" ENH-112 end mill with 2" flutes and 1" shank.



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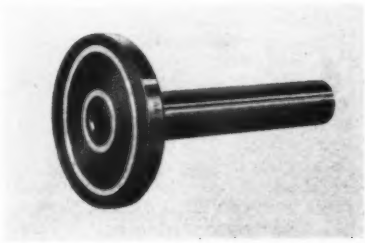

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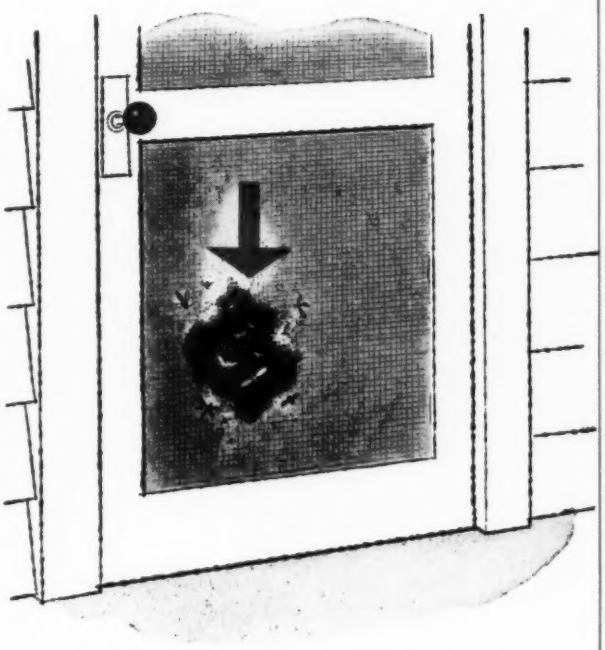

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A new precision hole borer, designed for production center drilling, drilling, and boring, has shown by tests to be considerably faster than conventional jig boring methods.

The machine was developed by The Canton Tool Manufacturing Co., Canton, Ohio, to meet a need for faster precision boring on repetitive operations. It holds bore accuracy and hole spacing accuracy within 0.0001".

In using the Canton precision hole borer, a master or template is made up with standard size holes drilled in locations to correspond with all desired finished holes in the workpiece. The template is mounted on the underside of a fixture designed for holding the workpiece. A disappearing locating pin is installed on the machine table in exact alignment with the machine spindle. This pin is of a diameter that will permit it to engage each hole drilled in the template.

In the operation of the hole borer, the fixture, holding the template on the underside and the workpiece clamped in place on top, is placed on the machine table, positioned so that the locating pin engages a hole in the template, and then is clamped in place. Thus, as the drill is brought into the workpiece, a hole is drilled exactly at one of the specified locations. To drill the next hole, the fixture is unclamped and moved manually over the locating pin until it engages the desired hole in the template. The fixture is clamped and drilling the hole in the workpiece is performed. This cycle of operations is repeated until all holes in the workpiece are completed.

The capacity of the hole borer permits the handling of a wide range of parts and hole requirements.

Fig. 1. The Canton hole borer permits precision drilling and boring on repetitive operations to be performed considerably faster than with conventional jig boring methods.

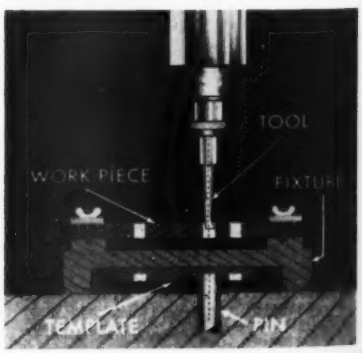

Fig. 2. Diagram shows new principle used in Canton Tool's precision hole borer to eliminate individual set-up and alignment on individual production parts. Locating pin in table of machine engages locating holes in template mounted underneath the fixture. Then holes in workpiece can be drilled or bored, maintaining original accuracy in template within 0.0001".

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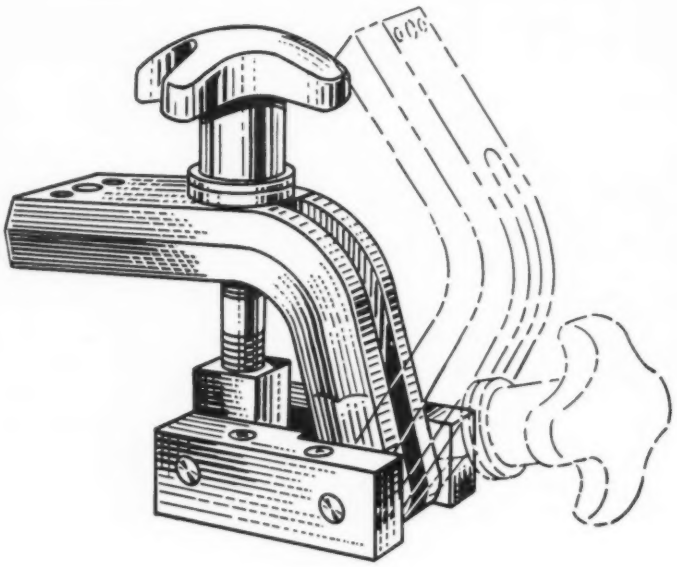

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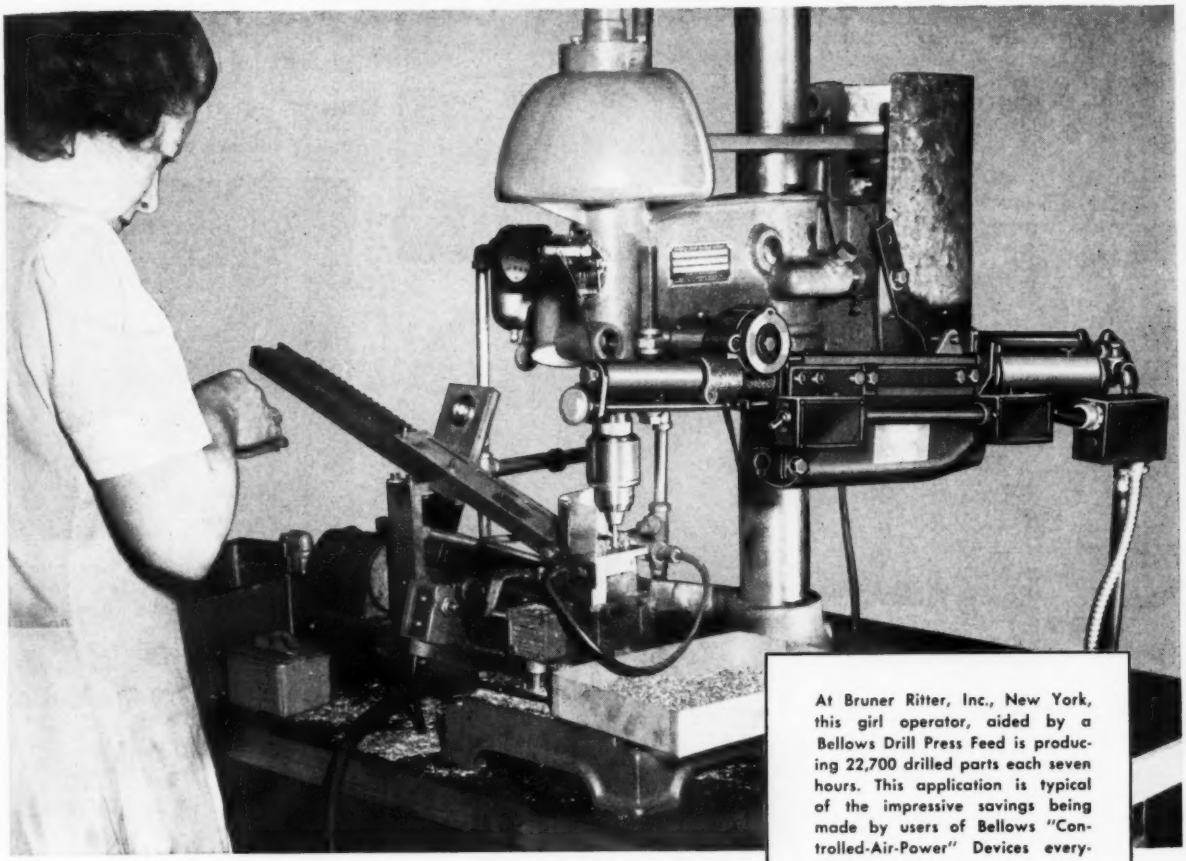

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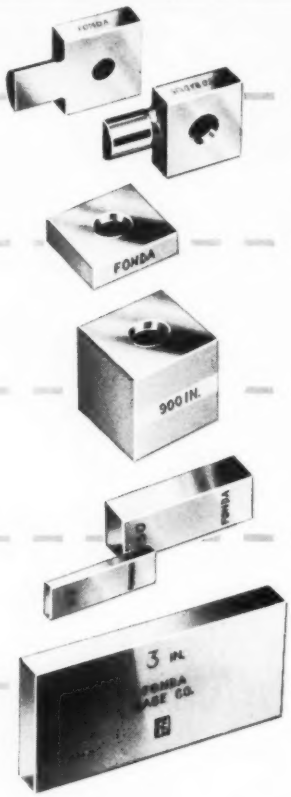

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NEW CARBIDE USES NICKEL BINDER FOR GREATER STRENGTH

A new, tougher, easy-to-grind, high-titanium carbide with nickel binder which promises to improve tool life in precision finishing and boring of steels is reported by Carboloy Department of General Electric Company, Detroit.

Tests show the new carbide to be much tougher than carbides normally employed for finishing steel and, although it is not quite as hard as cobalt binder type carbides, it is equally wear resistant. Its transverse rupture strength is about 200,000 psi with hardness about 91.5 Rockwell A. This is almost twice the strength of commonly used finishing carbide grades with hardness less than two points lower on the Rockwell A scale.

In the finishing area of machining, the new addition — called grade 330 — takes up where grade 350 leaves off, to round out Carboloy's line of 300 series carbides.

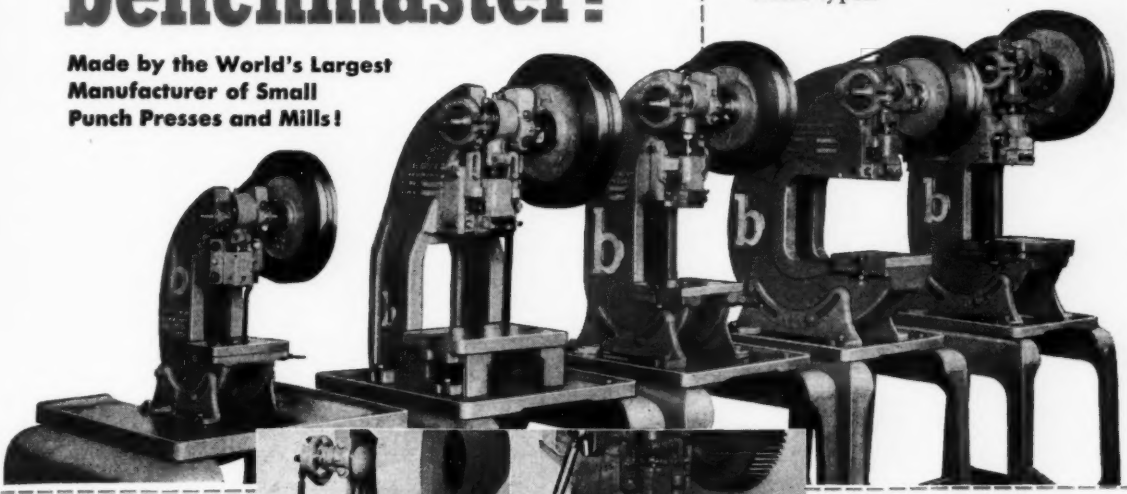
Due to its structure and added toughness, the new carbide is less susceptible to chipping or cracking than currently available finishing

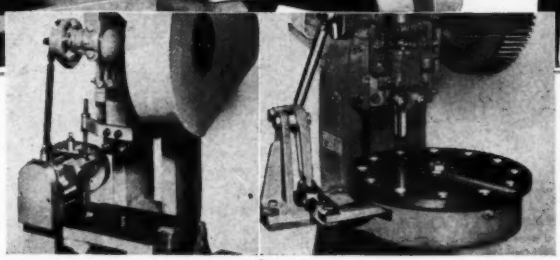
For high production AT LOW COST ...you can't beat benchmaster!

Made by the World's Largest Manufacturer of Small Punch Presses and Mills!

benchmaster PUNCH PRESSES

The most outstanding small presses in America and leaders for more than a decade! Now made in 2, 5 and 8 ton capacities. Many model variations for all manufacturing requirements... plain, back-geared, deep throat, half-presses and fixed-bed gap-frame types.





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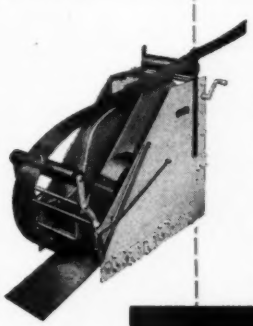
Lowest price on the market! Ideal for production work feeding small coil or strip stock. 3", 5", 7" and 9" roller widths. Two models, feeds adjustable from 0 to 3" cut-off or 0 to 6" cutoff. Plain, knurled or rubber covered rollers. Fits Benchmasters and other presses.

benchmaster ROTARY INDEX FEEDS

Converts your presses for automatically *marking, crimping, assembling, reaming, trimming, etc.*, at speeds up to 6000 strokes per hour. Easy installation—4 bolt mounting. Two sizes: 12" or 15" tables, 10 or 12 stations. Larger sizes on special order.

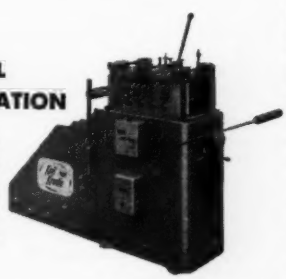
benchmaster KOIL KRADLES

Supplies a slack loop from which any machine can draw. Takes the drag off automatic feeding devices, increases feeding accuracy on progressive or multiple die operations; puts through more footage per hour. Many sizes: 1200 to 4000 lbs., 36" to 60" coil diameters, 10" to 28" widths. Larger capacities available.



benchmaster KOIL KRADLE AND ROLL STRAIGHTENER COMBINATION

Straighteners also available as single units. Feed rate variable 25 to 100 rpm, straightener thickness capacity .200". Other sizes available.



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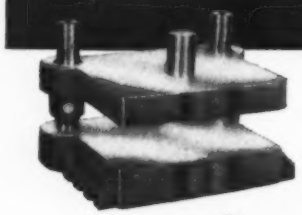

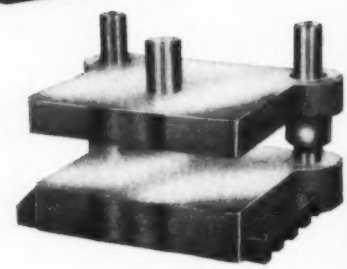

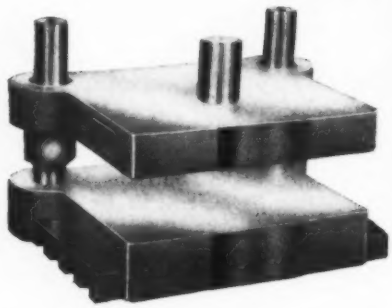

No Premium Price

No limitations to so-called "standard sizes" — result no waste — when you use Superior Die Sets. Superior sets are all *individually jig-bored to your specifications.* Result — the number of sizes you can get is almost limitless — you save on excess steel, needless machining, unnecessary weight and handling. Best of all, Superior Die Sets are priced competitively in all given sizes, so you save money in original cost by ordering only the exact size you need.

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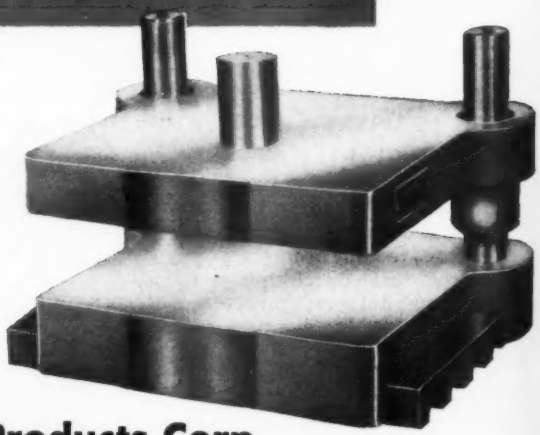

SUPERIOR **Steel Products Corp.**

2754 So. 19th Street, Milwaukee, Wis.

carbide grades during brazing, grinding, or in use. It can be ground easily on duplicating type grinders and, if accidentally crowded while grinding, it will not crack readily.

When used as a brazed tip, however, the new carbide requires the use of a special flux to provide proper wetting. According to Carboloy engineers, a silicon-bearing type flux used with generally available, lower-melting point, high silver solders provides satisfactory results.

An indication of the new carbide's toughness was revealed dramatically in one of several field tests. Here, the carbide was employed as a profile turning tool in machining SAE 1117 steel hydraulic valve lifters. For test purposes, the job was being run at various speeds — between 225 to 750 fpm, with the valve lifters being loaded and unloaded automatically.

During the test the work was not always fully chucked. This created a terrific work load on the cutting tool. But instead of breaking, the carbide tool was merely shoved back into the tool holder post. Previous carbides, under similar conditions, broke instantly. By resisting chipping or breakage, the new Carboloy grade 330 provided a tool life better than three times that of any carbide used previously for machining the lifters.

New Cut-Off Machine Features Precision Cutting

An entirely new model cut-off machine has been added to Walker-Turner's popular "Light-Heavyweight" line of machines. It has been developed for use with a dry-cutting abrasive wheel for cutting rod, bar, and tubing stock. It may also be used with high speed blades, and with conventional wood-cutting blades. Wheels and blades up to 12" dia can be used.

The precision of the machine is such that it cuts true and clean, thus eliminating many finishing operations.

The machine, built by Walker-Turner, Inc., Plainfield, N. J., can be equipped with an air-feed attachment for repeated production operations. It is a 100% pneumatic device, requires no electrical connections, and can be installed without machining. The feed attachment can be used in connection with either automatic stock feed, or hand feed.

An automatic spray coolant system, which supplied coolant to the blade while cutting, can be installed for either hand or air operated machines.

The machine table comes drilled so that the head may be mounted at 45° for mitering. Blades and saw blades are guarded by a heavy cast iron guard which provides 216° peripheral protection to the operator.

5603

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NEW Convenience
NEW Capacities
NEW Designs

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The Handy HAMILTON Portable, Elevating Table

NEW provision for increasing table area!

NEW provision for raising and lowering overhanging loads!

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NEW overhanging conveyor tops!

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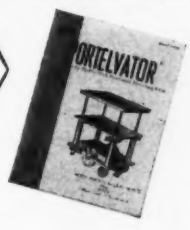
NEW FREE LITERATURE illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio.



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CIRCLE INFORM-A-GRAM KEY NO. 111

Compare

these BEST BUY Lempco press prices with prices of other producers:

Lempco Model No.	25M	50M	75M	100M	150M
Rated Tonnage	25	50	75	100	150
Press Operation	MANUALLY OPERATED				
*LEMPCO	$315	$440	$550	$1140	$1200
Competitor "A"	370	631a	679b	(X)	1405
"B"	375	515	645	1430	1650
"C"	(X)	565a	695	1365	1690
"D"	386	591	788	1541	(X)
Lempco Model No.	25 E-2	50 E-2	75 E-2	100 E-2	150 E-2
Rated Tonnage	25	50	75	100	150
Press Operation	2 H. P. PUMP UNIT				
*LEMPCO	$825	$875	$1050	$1720	$1920
Competitor "A"	(X)	(X)	(X)	(X)	(X)
"B"	1430	1430	1650	(X)	2640
"C"	(X)	(X)	(X)	(X)	(X)
"D"	1147c	(X)	(X)	(X)	(X)

*Prices effective April 15, 1956 . . . F.O.B. Lempco Plant, Bedford, Ohio . . . Prices subject to change without notice.

Model 50-E, 50-Ton Electrically Operated Hydraulic Press

Lempco Model No.	25 E-7	50 E-7	75 E-7	100 E-7	150 E-7
Rated Tonnage	25	50	75	100	150
Press Operation	7-1/2 H. P. PUMP UNIT				
*LEMPCO	$1150	$1200	$1380	$2050	$2250
Competitor "A"	(X)	(X)	(X)	(X)	(X)
"B"	(X)	(X)	(X)	(X)	(X)
"C"	(X)	1586	1716	2428	2713
"D"	1375c	1414	1623	2402	(X)

NOTE:

HYDRAULIC PRESS PRICE COMPARISONS ARE FOR EQUAL OR CLOSELY SIMILAR SPECIFICATIONS. (X)—No Model Listed; a—60-Ton Listed; b—80-Ton Listed; c—30-Ton Listed. Entries Indicate Nearest Reasonably Equal Specification Known to be Offered. Prices and Specifications are Effective, to the Best of Our Knowledge, on or about April 15, 1956.

LEMPCO INDUSTRIAL, INC. WHERE *QUALITY* CONTROLS

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CIRCLE INFORM-A-GRAM KEY NO. 112

Upgrading for Automation

Hydraulic circuits of increasingly-complex automation machinery require first-class care. The Packard-Clipper Division of the Studebaker-Packard Corporation is solving the shortage of skilled hydraulic maintenance specialists with a division-wide 40-week preventive maintenance program at its engine and transmission plant.

The first group of technicians to take the course were instructed in diagnosis, correction and prevention of hydraulic failures to reduce machine downtime.

Pointing to the vital nature of the problem, company officials maintain that if downtime becomes excessive on automated machines, or if there is a recurrence of hydraulic failures due to inadequate service information, the increased employment, cost savings and quality production resulting from the entire automation program would be destroyed. Therefore, the need for skilled hydraulic maintenance men must be met.

The two-hour weekly training sessions are divided into 12 separate categories: an introduction to hydraulics, simple mechanics and statics, pumps and operating principles, pump characteristics, fluid motors, valves, J.I.C. hydraulic standards, circuit development, friction, electrical controls, system accessories and maintenance, and safety.

Time Consuming Research Pays Off

It may take from five to seven years before a research project in industry begins to pay off, but in the long-run it is well worth it.

This observation was expressed by Dr. E. W. Hanford, vice president of research and development of the M. W. Kellogg Company, at the National Industrial Research Conference in Chicago.

"Even with this timetable," he said, "I am starting with the first successful laboratory experiment and not with the beginning of the project." It may take anywhere from one week to several years before the researcher is able to complete his first successful experiment.

"Before research is commercially successful many people have contributed to the effort," he pointed out. "Is it any wonder that in the years from the conception of the idea to reality, the researcher and his contribution are often forgotten in the enthusiasm to bring home a winner?"

Research, Dr. Hanford holds, is as vital to the health of an industry as blood is to the human metabolism. The decision by management to proceed with development work and final capitalization of a research effort requires a great deal of foresight, fortitude, and courage, he declared.

"The easiest thing for management to do is to bank the profits, expand what they have, and keep things at status quo." In the long run, he pointed out, this would be an unprofitable program for any firm to follow.

"Just as business is competitive," Dr. Hanford warned, "so is research" and if a company's objective is selected wrongly, competitors may beat that firm to the solution with the same product or even a better one.

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC®
Super Sensitive
Variable Speed
Small Hole
Precision
Drilling Machine

Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 5/16" in all drillable materials) is super sensitive. Provides speeds, infinitely variable, between 840 R.P.M. and 9300 R.P.M. Is built to precision tolerances, and with the stamina to retain precision.

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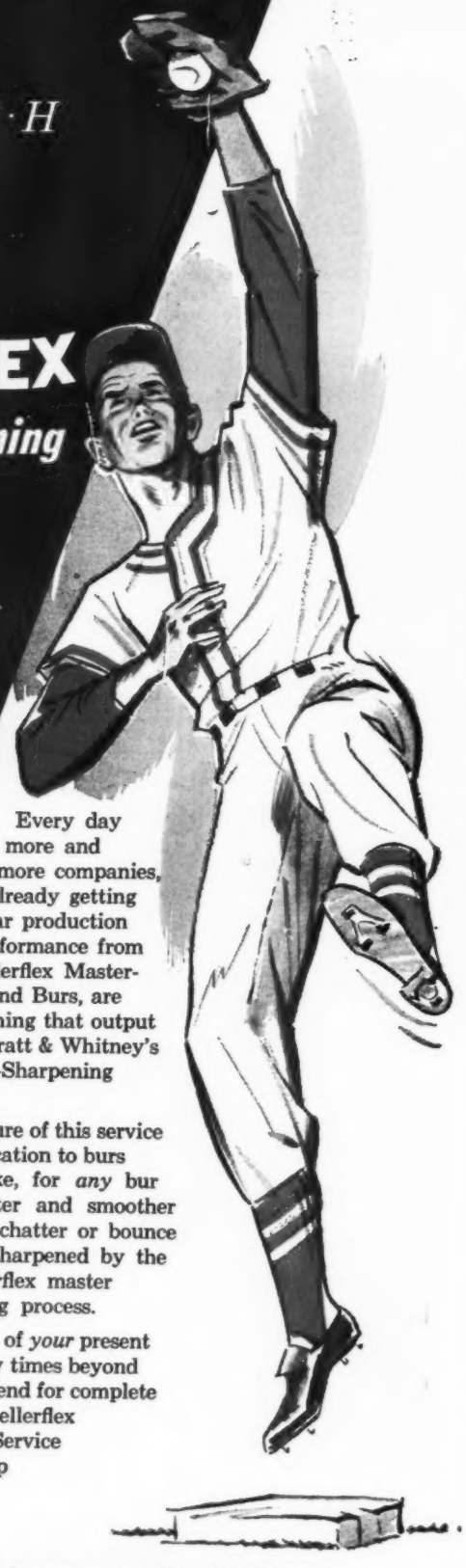
Puts the S·T·R·E·T·C·H in a Star Performer

KELLERFLEX
Bur Re-Sharpening Service



Every day more and more companies, already getting star production performance from Kellerflex Master-Ground Burs, are stretching that output with Pratt & Whitney's Bur Re-Sharpening Service.

A hit feature of this service is its application to burs of any make, for *any* bur will cut faster and smoother . . . without chatter or bounce . . . when re-sharpened by the exclusive Kellerflex master machine grinding process.

Stretch the output of *your* present bur inventory many times beyond the original grind. Send for complete information on the Kellerflex Bur Re-Sharpening Service and the all-star line-up of Kellerflex Burs.

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MACHINE TOOLS • GAGES • CUTTING TOOLS

By-line Briefs:

DONALD H. SUNDERLIN knows management as a Management Consultant for 200 firms. His views on "The Emergence of the Professional Executive" are described herein. Before opening his consulting office 16 years ago, Mr. Sunderlin spent 18 years in engineering and management positions.

For FRANS BROUWER, author of the article in linear positioning, the age of automation might have been custom-designed. As a student in the Netherlands he developed intense interest in automation. Today it still dominates his thinking as a product development engineer at the Canadian Westinghouse Company. His newest appointment to the special products group there will doubtless open new doors to his favorite subject.

CLIFFORD T. BOWER, frequent contributor of "know-how-show-how" articles, spends part of his time as associate editor of two British technical journals.

Both GEORGE W. HAYES and JOHN E. CRICHTON, co-authors of the article on using plastics in producing auto part prototypes, have wide experience which enables them to utilize plastics in tooling to utmost advantage. Mr. Hayes has been associated with sheet metal work for 22 years. Mr. Crichton's experience in control tooling spans 35 years.

FRED LUCHT, probably this country's leading contributor to the fields of carbide milling, gun drilling and trepanning, retired recently as a design and application engineer at Carboloy. Author of many T & P articles, he then rejoined Goddard & Goddard Company, Detroit, where he is now setting up a cutting tool application research lab.

ERNEST J. URBAS, T & P Contributing Editor, received first prize in national competition for a paper on new stamping techniques at a recent Patent Conference in Cleveland.

DIAMOND INDUSTRY IN REVIEW

As in previous years, the Industrial Diamond Information Bureau of London has compiled a survey of the diamond tool industry, dealing with various scientific and technical aspects. Practically all branches of the industry, the report states, made important advances during the past year. These are covered in the report.

The subject matter is based mainly on the Bibliography of Industrial Diamond Applications and is sub-divided into 16 main groups, with about 200 references quoted and listed for further information.

Copies of "The Diamond Tool Industry in 1955" are available from Industrial Diamond Information Bureau, 32/34, Holborn Viaduct, London, E.C.1., England.

MACHINERY LEASE POPULARITY FALLING

Many inquiries received by machinery manufacturers about equipment lease programs result in installment sales rather than leases, W. J. Rekstis, Jr., assistant vice president of C.I.T. Corporation, told the annual convention of the National Association of Credit Men recently.

"The actual experience of a number of manufacturers and dealers who have offered lease programs has been that the terms and the financing are the basic factors influencing their customers — not any desire to lease as opposed to buying," Rekstis said. "A small percentage of the prospective users of the machinery have gone through with a true, long-term leasing arrangement."

The new, faster depreciation schedules allowed machinery owners since 1954, combined with modern long-term financing that gears payments to these depreciation schedules, he declared, have given machinery users the advantages they sought in leasing.

"After examining the lease and purchase programs available, and studying the arguments on tax and balance sheet advantages, prospective users of machinery generally come down to one basic consideration: After the payments have been made, they want to own the machine. They do not want to return it. They want to continue using it as owned equipment or realize its residual value."

In speaking of taxes on leased equipment, Rekstis cautioned that most "so-called leases" — those in which rentals equal the sales price and those with options to buy or which result in ultimate ownership —are treated by tax authorities as sales.

NORTON OFFICIALLY OPENS COAST PLANT

Norton Company's new grinding wheel plant at Santa Clara, Calif., is the only one on the West Coast making a complete line of grinding wheels, including diamond wheels.

The plant, which has been in operation a few months, incorporates the latest developments in the industry. At the recent official opening, company executives pointed out that many pieces of equipment and many of the methods used there were developed at Norton's main plant in Worcester, Mass. These include the automatic electric tunnel kilns, automatic molding machines for small diameter wheels, dust control equipment, and handling equipment.

Deliveries to customers in the area have been appreciably shortened because of the plant's proximity to the growing Western market.

NOW CUT COST OF PRECISION GEAR PRODUCTION

THIS FEATURE: "Independent selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,

AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.

THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,

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CIRCLE INFORM-A-GRAM KEY NO. 115

The appointment of **Roger M. McCray** as product sales manager has been disclosed by Kennametal Inc. In his new position, Mr. McCray is concerned primarily with sales development of the company's products in the metalworking industry.

Robert P. Marks is a field sales representative for The Allen Mfg. Co. according to an announcement by **Willis D. Horner,** sales manager. Mr. Marks represents the firm in San Francisco and the northwest with headquarters in San Francisco.

◆

Crucible Steel Co. of America has named **Robert M. Simpson** as manager of its Los Angeles sales branch. He joined the company in 1941. The new manager of the San Francisco sales branch is **Kenneth M. Acton,** who is replacing Mr. Simpson in that capacity. Mr. Acton has been with the company since 1941.

the cutting characteristics and life of your taps are important factors in your costs of production.

BLAKE Flute and Chamfer Grinders can make substantial savings possible in your threaded-hole costs. They do this by creating or restoring:

1. Exact indexing of cutting edges.
2. Efficient rake angles for each job.
3. Correctly ground spiral points.
4. Perfectly relieved chamfers.

The accuracy and dependability of the Blake Flute Grinder and Blake Chamfer Grinder make it possible for you to do high-efficiency tapping . . . the *only* kind which pays off in profits today!

Send for the details now.

EDWARD BLAKE COMPANY INC.
MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS
442 CHERRY ST., WEST NEWTON 65, MASS.
Exclusive Distributors of:
BLACK DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS • WORCESTER DRILL GRINDERS

CIRCLE INFORM-A-GRAM KEY NO. 116

Benjamin E. Storrs has been appointed carbide cutting tool specialist for Carboloy Department of General Electric Co. In his new position Mr. Storrs is working directly with machine tool builders and tool makers, in addition to co-ordinating carbide sales activities with the department's district offices. **E. Louis Kapernaros** recently joined Carboloy as a carbide cutting tool sales representative in the Newark, N. J., area.

◆

The new machine tool sales manager for Axelson Mfg. Co., Division of U. S. Industries, Inc., is **Henry C. Miller.** He is in charge of all national sales of Axelson lathes and milling machines. **Bernard C. Dunn** has been appointed sales engineer-milling machines. He has had many years experience in experimental and production tooling in industry.

◆

James E. Barnes is the new sales manager of Buhr Machine Tool Co. His appointment was announced by **A. A. Vetter,** vice president in charge of sales.

◆

Sargeant & Wilbur, Inc. has made known the appointment of **Morris William Jones** as general sales manager. He has been associated with Gulf Oil Corp. and C. I. Hayes, Inc.

◆

Anthony J. Pelson has taken over as assistant sales manager in charge of distributor sales for Continental Screw Co. The announcement was made by **Victor Ladetto,** the company's vice president and sales manager.

◆

Two new sales engineers have been named by the Abrasives Division of Elgin National Watch Co. Appointed to the Chicago area and eastern Missouri territory, including St. Louis, is **Arthur Leaver.** He is working out of headquarters at Elgin, Ill. **John Wiziarde** with headquarters in Cleveland, has been assigned to handle the Ohio sales territory. Both men will handle the company's complete line of diamond compound, carbide and rotary tools, and Elgiloy spring material.

◆

Leonard A. Rafferty is managing the Pittsburgh office of The Motch & Merryweather Machinery Co. Mr. Rafferty who has been with the company for 39 years, succeeds **J. T. McCuen** who will continue in a sales consultant capacity in that office.

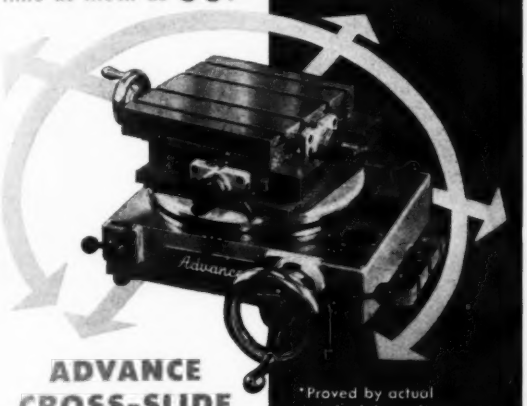
◆

John A. Marsh is the new vice president in charge of air and hydraulic sales for Rivett Lathe & Grinder, Inc.

Cut Die-Making Cost

by reducing set-up time as much as 90%

With Jig Boring Accuracy



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ADVANCE CROSS-SLIDE ROTARY TABLE

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work. Write for specifications and literature today.

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Capacity, 90° notch 4¼" deep in 16-ga. mild steel. V-ram with adjustable gibs assures positive blade and die alignment. Aviation type bearings for smooth and easy operation. A useful, versatile tool for any metal shop.

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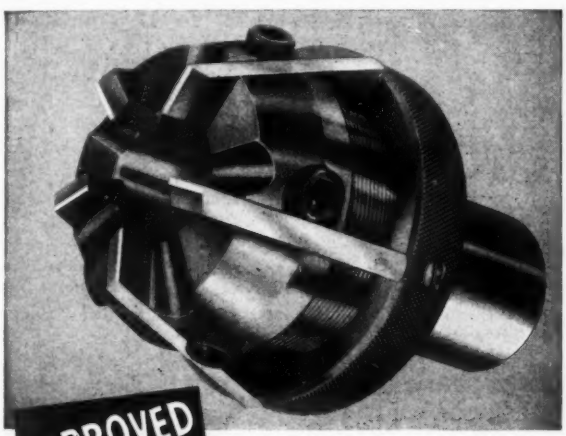

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There is a size and style Genesee for every hollow milling job. Standard sizes from 0 to 2", standard with straight or Morse Taper shanks carried in stock.

- Quick — easy adjustment
- Simple sharpening method
- High speed steel—cast-alloy —Carbide tipped blades
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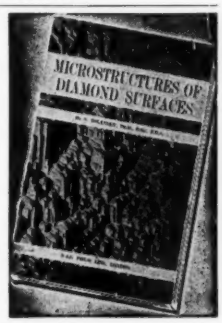
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools

CIRCLE INFORM-A-GRAM KEY NO. 1172

MICROSTRUCTURES OF DIAMOND SURFACES

by S. TOLANSKY, Ph.D., D.Sc., F.R.S.



The remarkable pictures obtained by Professor Tolansky in his research laboratory and reproduced in this book (many of them never before published) enable fundamental new deductions to be made regarding the nature of diamond surfaces and therefore of the growth of diamond.

The text is written for the general reader and includes an elementary introduction to the optical techniques developed by Professor Tolansky that make such photographs possible. These techniques enable height or depth features as small as one twenty-five millionth of an inch to be resolved and effective magnifications in depth of half a million times to be made by simple and inexpensive means. One hundred and forty-three of these extraordinary pictures are reproduced as special plates in this book. $8.50* per copy.

CONTENTS:

The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip?)
The Etching of Diamond
Diamond Cleavage
Optical Shadow Casting
Percussion (Pressure) Marks on Diamond
Polished Diamond
143 Special Art Plates

Huebner Publications, Inc., 1975 Lee Rd., Cleveland 18, O.

Gentlemen: Please send me_____copies of the book "MICROSTRUCTURES OF DIAMOND SURFACES" @ $8.50* per copy.

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TITLE_____

COMPANY_____

STREET_____

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Open account shipments on company purchase orders. Otherwise check with order, please. No C.O.D.'s. *Ohio customers add 3% sales tax.

MEN YOU SHOULD KNOW

Elgin National Watch Co. has announced the appointment of **Douglas Graham** as production manager of the Abrasives Division. He will be in charge of the company's new carbide tool program.

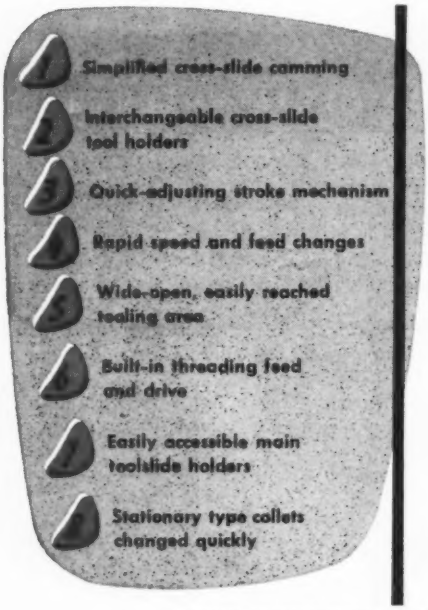
◆

David J. Munroe has been named president of Webster Electric Co. He succeeds **Preston G. Crewe** who took over the newly-created post of vice chairman of the board of directors.

The election of **David A. Wallace** as vice president in charge of sales and **E. L. Ritter** as vice president in charge of engineering has been announced by Cincinnati Lathe and Tool Co.

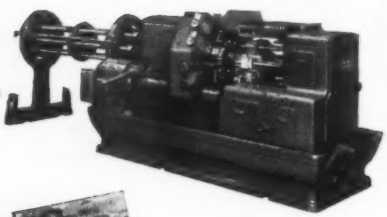
◆

Ralph J. Mancuso, Jr. is filling the post of chief administrative engineer of the Aircraft Division of Ledkote Products Co. of N. Y., Inc. He is in charge of all aircraft and allied tooling.


1 Simplified cross-slide camming
2 Interchangeable cross-slide tool holders
3 Quick-adjusting stroke mechanism
4 Rapid speed and feed changes
5 Wide-open, easily reached tooling area
6 Built-in threading feed and drive
7 Easily accessible main toolslide holders
8 Stationary type collets changed quickly

eight big reasons why you get *Fast Setups* **on GREENLEE BAR AUTOMATICS**

In plant after plant countless hours of setup time are saved each year on Greenlee Bar Automatics. Similar savings in time and money can be achieved in your own plant. Greenlee has on-the-job case studies to prove it. Whether your responsibility lies in the field of management . . . production . . . engineering . . or purchasing you owe it to yourself and your company to call in the Greenlee man. Let him show you why and how faster setups on a Greenlee pay off in greater profits.



PRODUCTION MACHINERY GREENLEE

4-SPINDLE...6-SPINDLE
SECOND-OPERATION
PNEUMATIC STOCK FEED

WRITE TODAY FOR CATALOG A-405

GREENLEE

GREENLEE BROS. & CO.
2047 Mason Avenue
Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 118

Appointment of **Vernon H. Vogel** as director of engineering for the Aeronautical Division of Robertshaw-Fulton Controls Co. has been announced by **Robert L. Wehrli,** general manager. The post is newly-created to unify several engineering functions and to implement a project approach linking the developmental and production activities of the division.

◆

Jack A. Yoblin has been appointed carbide products development engineer for Carboloy Department of General Electric Co. Prior to joining the company, he was with Titanium Metals Corp. of America. **Paul D. Wright** has been named research engineer in the advanced development section.

◆

Earl C. Hughes has been promoted to executive vice president and **Harold G. Clayton,** to vice president in charge of manufacturing for Bay State Abrasive Products Co. The announcement came from **Leonard M. Krull,** chairman of the board of directors.

◆

The new manager of operations for Vacuum Metals Corp. is **Arthur E. Franks. Christopher S. Houghton** is replacing Mr. Franks as superintendent of melting.

◆

The promotion of **John W. Shingler** to chief tool engineer has been disclosed by Pivot Punch and Die Corp. The advancement is linked with the company's recent expansion of facilities for the design and production of tools, dies, gages, jigs, fixtures, and special machinery.

◆

Marvin R. Anderson is the new president of Michigan Tool Co. He succeeds **Oscar L. Bard** who moves up to the position of chairman of the board. Mr. Anderson has been with the company since 1935. Mr. Bard, president of the company since 1940, started with Michigan Tool 40 years ago.

◆

The Heli-Coil Corp. has announced the appointment of **Eduard Baruch** as president. He was instrumental in forming the corporation.

◆

Dr. Severin Raynor is the new director of the Mechanics Research Department of American Machine & Foundry Co. The announcement was made by **Fred K. Powell, Jr.,** vice president in charge of engineering.

◆

Abrasive Dressing Tool Co. has disclosed the appointment of **John Booth** as vice president in charge of research. Mr. Booth will head the company's continuing research and study of Red Band diamond tool development and new trends in industrial diamond usage. He was formerly with X-Ray Inc.

MEN YOU SHOULD KNOW

Robert W. Miller is now associated with the Process Machinery Department of The Cincinnati Milling Machine Co. He has had many years of experience in the development of various types of induction heating machines. In a recent organization meeting, **Walter W. Tangeman** was elected chairman of the board; and **Swan E. Bergstrom,** executive vice president.

◆

L. J. Lieberthal has taken over as general manager of Conduit Fittings Corp., division of U. S. Industries, Inc. He succeeds **M. J. Weiss** who recently resigned from the position. Mr. Lieberthal who has been associated with U. S. Industries since 1946, will make his headquarters at Conduit's main office and plant in Chicago.

◆

Edward K. Dyer is serving as director of consulting of Executive Services, National Institute of Management, Inc., according to an announcement by **Nyles V. Reinfeld,** managing director. Before joining Executive Services, Mr. Dyer was at Glenn L. Martin Co. and Charles E. Hill and Associates.

◆

The newly-created position of vice president in charge of engineering for Minneapolis-Honeywell Regulator Co. is filled by **Glenn E. Seidel.** He has been a member of the company's engineering organization for almost 14 years. Mr. Seidel is now responsible for coordinating and directing research and engineering activities throughout the corporation.

◆

Neil E. Firestone has been named manager of manufacturing operations service for General Electric Co. **Armand V. Feigenbaum** has taken over as manager of quality control service. The new general manager of the company's Distribution Assemblies Department is **John S. Macdonald.**

◆

Earl Cote has been promoted to vice president and general manager of Webb Forging Co. He has a background of over 25 years in all phases of the forging business.

◆

George J. Carvalho has become general manager of Jarvis Power Tools, Inc., a subsidiary of Jarvis Corp.

◆

Edward P. Gillane has been elected executive vice president and a director of Pratt & Whitney Co., Inc. **J. Potter Cunningham** will succeed Mr. Gillane as president of Potter & Johnston Co., a Pratt & Whitney subsidiary. **Gordon W. Smithson** has been named vice president and chief engineer for Potter & Johnston Co.

Nils G. Goranson is the new vice president in charge of export sales for The Ohio Knife Co. He will headquarter at the company's New York City office.

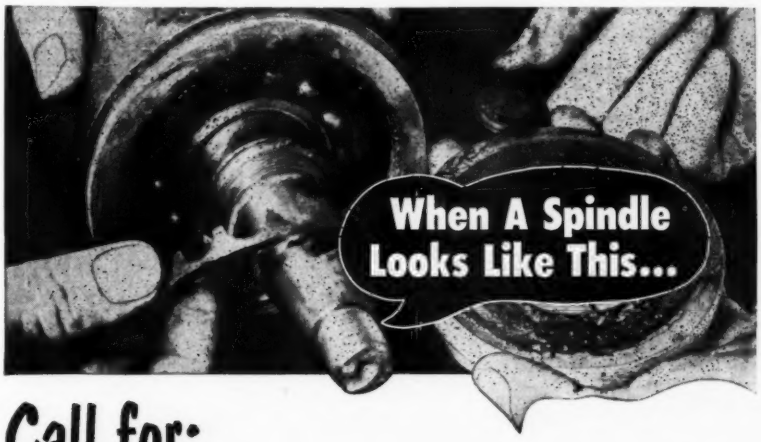
◆

Chester C. Lonsdale is the new assistant to the superintendent of the Pressed Steel Division of Standard Pressed Steel Co. He is in charge of manufacturing and packaging for the division. Mr. Lonsdale joined the company 15 years ago.

Edward S. Ruth is replacing **Frank R. Bridges** who has resigned as chief engineer of The Gamewell Co. Mr. Ruth formerly was associated with Edwards Co., Inc.

◆

Harry C. Doane has become assistant to **Charles A. Chayne,** General Motors vice president in charge of engineering staff. He has been assistant chief engineer for Buick Motor Division. Mr. Doane has been with GM since 1917.



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CIRCLE INFORM-A-GRAM KEY NO. 119

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

A Power Transmission Equipment Catalog features flexible couplings, variable speed pulleys, wide variable speed belts and sheaves, variable speed transmissions, motor bases, and universal joints. Each product is shown complete with a description and specifications. Get your copy of the catalog from Lovejoy Flexible Coupling Co., 4949 W. Lake St., Chicago 44, or —
Circle Inform-A-Gram No. B1.

For Faster and Better Finishing use Schauer Speed Lathes. They will perform finishing operations such as polishing, lapping, and deburring on shafts, pinions, gears, and other similar products. Catalog 530 with descriptions, illustrations, specifications, and photos of unusual adaptations of the lathes, is made available by Schauer Mfg. Corp., Cincinnati 36, O., or —
Circle Inform-A-Gram No. B2.

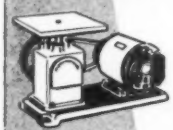
Saves Time, Saves Money - - and Does the Job Better

the NEW

KELLER Die Filers

DELUXE: Files, Saws, Laps. Has File Roller Support Arm and Overarm.

Standard: With File Roller Support Arm for Maximum Accuracy



ECONOMY: Has no File Roller Support Arm or Overarm.

- Self Compensating File Chuck
- Wide Capacity— 1/8" diam. to 1/2" x 5/8" Files.
- Throat Depth 7 1/4"
- Two Speeds— 350/450 strokes per minute.
- Full 1 1/2-Inch Stroke.

Built-for-the-Job Handles all shapes and sizes of files from 1/8" diam. to 1/2" x 5/8". File Roller Support has full 6-inch adjustment for Maximum Accuracy on all jobs.

Large 8 1/2" x 8 1/2" Worktable with plenty of room for clamping guide blocks, etc. Table tilts up-to 15-degrees in any direction and is locked by four knurled thumbscrews.

Long, Dependable Service . . . the Scotch Yoke is splash lubricated and equipped with Oilite Bearings throughout.

Plenty of Power — 1/4 H.P. 1800 rpm motor.

Write for Bulletin 256, and your distributor's name.

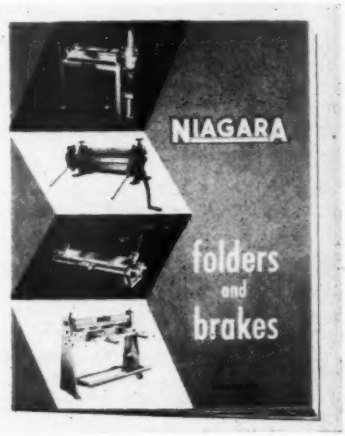
SALES SERVICE MACHINE TOOL CO.
2351 University Ave. St. Paul W14, Minn.

ACCESSORIES: Steel Floor Stand, Hinged Belt Guard, and Gooseneck Lamp.

KELLER *Power* **Die Filers**

Built by the makers of KELLER Power Hack Saws
CIRCLE INFORM-A-GRAM KEY NO. 120

The Modernized Lines of folders and brakes, both air actuated and hand operated models, are presented in Bulletin 74 from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. Clearly described



and illustrated are adjustable bar folders, foot brakes, and universal folders and brakes. Complete specifications are given for each of the models.
Circle Inform-A-Gram No. B3.

Using New Transfer Presses with simple dies, stampings requiring blanking, piercing, and secondary operations, can be made complete. The straight-sided design keeps deflection to a minimum resulting in a more uniform and precise finished product. Further details on the Intomaco transfer presses are found in a circular from Durant Tool Supply Co., 136 S. Water St., Providence, R. I., or —
Circle Inform-A-Gram No. B4.

Standard Circular Form Tools are featured in a catalog and price list from Somma Tool Co., Inc., 19 Brown St., Waterbury, Conn. Over 600 sizes of the circular form tools and blanks are carried in stock. The catalog also covers standard tools and blanks for Davenport machines.
Circle Inform-A-Gram No. B5.

Versatility for Vertical and Angular Milling and Boring is a feature of the U. S. vertical milling machine. It is built to high standards of rigidity for accuracy. A description of the machine and its features, complete with specifications, is found in literature from The U. S. Burke Machine Tool Div'n, Cincinnati Mfg. Corp., Brotherton Rd., Cincinnati 27, O., or —
Circle Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Forming, Cutting, Punching, and Notching Operations in medium and lightweight materials is performed by Di-Acro metalworking machines. A catalog gives, in tabular form, machine specifications and material forming capacities. Photographic case histories tell how numerous companies are applying "Die-less Duplicating" techniques to their particular problems. Nine basic machines are available in 45 sizes. The catalog, "Di-Acro Precision Machines for Die-less Duplicating," is available from O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn., or —
Circle Inform-A-Gram No. B7.

Lathes, Hydraulic Tracing Attachments, hydraulic collet chucks and bar feeds, automatic opening threading dies and holders, automatic thread and form grinders, and optical and custom designed comparators are included in a new 20-page catalog. In addition, the standard gaging fixtures for optical comparators are listed. For copies of illustrated Catalog 55, contact Jones & Lamson Machine Co., Springfield, Vt., or —
Circle Inform-A-Gram No. B8.

"Twin-Head" Gear Generators have been designed to provide precision with high-speed operation in the production of gears of all types which operate on parallel axes. These universal machines will do a maximum range of work with the greatest possible ease and economy. The general design, features, specifications, and capacities are found in Bulletin T-455 available from Farrel-Birmingham Co., Inc., Ansonia, Conn., or —
Circle Inform-A-Gram No. B9.

A Complete Line of motor driven automatic coil cradles and straightening machines is presented in a catalog from Rowe Machinery and Mfg. Co., Inc., 1506 N. Industrial Blvd., Dallas, Tex. In addition to the "Easy Load" machine, accessories for handling coil stocks are included.
Circle Inform-A-Gram No. B10.

Exceptionally Safe, Versatile, and Rugged is the 15-ton Electro-Safe punch press. The press which is designed for fast precision stamping, is available as a standard or deep-throat model. For further details and specifications, get a bulletin on the press from Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, or —
Circle Inform-A-Gram No. B11.

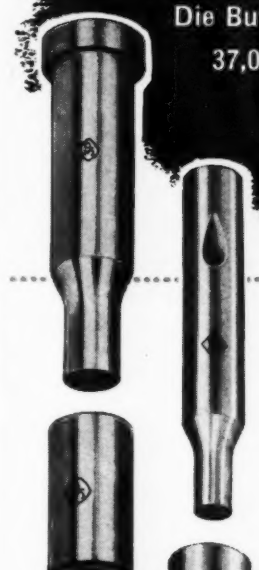
Increase Production Per Tool with small cutting tools of extreme precision engineered to specific requirements. Among the tools covered in a new catalog are recessing and back chamfering tools for screw machines, hollow mills, counterbores and step drills, and reamers. Copies of Catalog 20 are provided by Woodruff & Stokes Co., Inc., Bldg. 38, 349 Lincoln St., Hingham, Mass., or —
Circle Inform-A-Gram No. B12.

Heavy Duty Precision Threading of large diameter workpieces is performed by 32C and 48C Landmaco threading machines. Twelve spindle speeds are provided by pick-off gears and a 25% rapid speed change from any given speed. The design features complete with illustrations are described in detail in Bulletin H-45-2 made available by Landis Machine Co., Waynesboro, Pa., or —
Circle Inform-A-Gram No. B13.

When it's SERVICE you want ...call PORTER!

3P

IMMEDIATE DELIVERY of 3-P Punches and Die Buttons is made possible because over 37,000 Standard sizes are in STOCK. In fact, Porter Precision Products are stocked in all principal cities.



Paired for Production

The 3-P catalog can save you thousands of dollars. It contains a perfect pair — to answer every piercing need. PORTER head PUNCHES and DIE BUTTONS are made from three types of finest tool steel, and are offered in any DECIMAL size.

Completing Porter's Production team are the new 3-P BAL-LOK* Punches and Die Buttons. These, too, are available for immediate delivery, any DECIMAL size. "Down time" is cut to a minimum — and you pay nothing extra for the extra quality — or for DECIMAL sizes. Better yet, all PORTER PUNCHES and DIE BUTTONS are completely interchangeable! So save time — save money. Write for full details today, and get the PUNCH you need — WHEN you need it!

* Reg.

"Still the best performer"

PORTER PRECISION PRODUCTS

PRinceton 1-6338 · P.O. Box 208 · Cincinnati 15, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 121

Lower Unit Costs and Broader Work Range resulting from greater machine rigidity, accuracy, and speed are possible with Hypro double housing planers. A bulletin describes and illustrates in detail the features of the planers. In addition, there are sections on the operating controls and optional equipment and arrangements. Get copies of Bulletin 250 from Giddings & Lewis Machine Tool Co., G & L and Hypro Div'n, Fond du Lac, Wis., or —
Circle Inform-A-Gram No. B14.

Deburring and Chamfering Tools are the subject of a bulletin supplied by Cogsdill Tool Products, Inc., 12980 W. Eight Mile Rd., Oak Park 37, Mich. Included are data sheets outlining various types of applications, methods, and procedures for applying "BurrAway" and "Burra-Matic" tools. One section covers tube deburring which is a new method of chamfering the inside and outside edges of tubing simultaneously introduced by the company.
Circle Inform-A-Gram No. B15.

DURABLE

The 1-2 PUNCH that KO.'s
PRESS DOWN-TIME
PRODUCTION DELAYS

HERE'S THE SECRET OF DURABLE'S SUCCESS:

1. VERTICAL LAPPING
. . . gives a "grinding grain" parallel to plane of action—reduces friction, heat, firing and galling.

2. ELECTROCOATING
. . . chrome carbide has 25% less friction than plain steel—further reduces friction, heat, firing and galling.

The DURABLE combination of VERTICAL LAPPING plus ELECTROCOATING knocks out your production delays with fewer shut-downs, less die maintenance, longer uninterrupted production. Vertical Lapping and chrome electrocoating make the Durable Patent Piercing Punch the perfect answer to YOUR PERFORATING PROBLEMS.

CUTS DOWN-TIME—
RETARDS FIRING AND GALLING—
GIVES MUCH LONGER PUNCH LIFE

Write today for full details on YOUR punching problems. You'll receive a fast, practical reply from the most DEPENDABLE punch maker in the world!

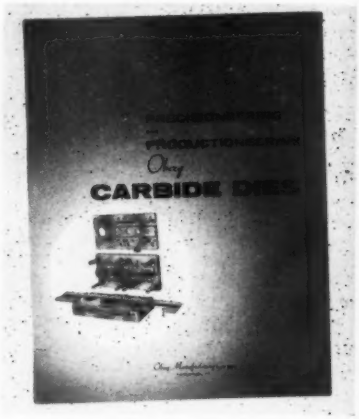
DURABLE NIB PUNCH gives improved punching on harder alloys.

DURABLE INTERMESH SLEEVES supports Punch so as to perforate metal many times thicker than hole diameter

IF IT'S DURABLE IT'S DEPENDABLE

Patented and made exclusively by
DURABLE PUNCH & DIE COMPANY
1214 W. Madison Street, Chicago 7, Illinois
CIRCLE INFORM-A-GRAM KEY NO. 122

Carbide Dies are the subject of a 48-page booklet published by Oberg Mfg. Co., Inc., Tarentum, Pa. Discussed is the company's "Package Program" which consists of a study of the production problem, design



and building of the die, construction of auxiliary tooling, and production proving before shipment. Separate sections cover custom designed dies, calculations, lubrication, characteristics, etc.
Circle Inform-A-Gram No. B16.

Quickly Check Thread Lead Error or Centralization with a portable lead testing comparator. Its range is from ⅞" dia to 2½" dia threads with standard floating "V" blocks. Screws can be checked after they are heat treated, during the finish operation, or anytime they are on or off of the machine. Details are in a circular from Jerpbak Bayless Co., Solon Rd., Solon, O., or —
Circle Inform-A-Gram No. B17.

Versatility and Greater Accuracy at Lower Cost are possible with down-acting four column hydraulic presses. These presses feature variable pressure, adjustable stroke, a wide range of speeds, and fast traverse with slow pressing. They have manual, semi-automatic, and full automatic controls. Their capacity ranges from 25 to 200 tons. Write to K. R. Wilson, Inc., Arcade, N. Y., for copies of Bulletin 95 containing details on the presses, or —
Circle Inform-A-Gram No. B18.

A Complete Line of Resistance Welders is covered in Bulletin G-100 from Precision Welder and Flexopress Corp., 3520 Ibsen Ave., Cincinnati 9. In addition to the standard and semi-standard line, special welders designed for improved, economical, faster fabrication of metal products are described.
Circle Inform-A-Gram No. B19.

Spur or Helical Gears up to 1¼ dp are handled by Model R ultra heavy-duty hobbing machine. Model R is designed for heavy hobbing on heavy gears, ease of loading and unloading, ready access to index and feed change gear, and ease of maintenance and operation. The machine's features are listed in a bulletin from The Lees-Bradner Co., Cleveland 11, or —
Circle Inform-A-Gram No. B20.

Speed Up Production with Float-Lock instant-change vises for drill presses and band saws. The vises have 9" and 12" capacities. Other time savers are Wahlstrom full-automatic instant-change chucks and tapping attachments. For literature with complete details, write to American Machine & Foundry Co., 261 Madison Ave., New York 16, or
Circle Inform-A-Gram No. B21.

Liquid Spring Shoks have been designed as a liquid spring with a built-in shock absorber using liquid compressibility and dampening. Their design incorporates integral hydraulic levering, permitting spring forces as low as 600 lbs with a 2" stroke plus energy absorption as a shock absorber. Catalog SS describing and illustrating the Liquid Spring Shoks has been published by Taylor Devices Inc., 188 Main St., N. Tonawanda, N. Y., or —
Circle Inform-A-Gram No. B22.

"Refractory Molybdenum Borides" describes the applications; chemical, physical, and mechanical properties; and preparation of molybdenum boride compounds. Complete data is given for 4 molybdenum borides and 7 multi-boride systems. Also given are details for preparing and forming molybdenum borides and multi-boride systems. For your copy of Bulletin Cdb-8, contact Climax Molybdenum Co., Dept. L, 500 Fifth Ave., New York 36, or —
Circle Inform-A-Gram No. B23.

A Line of Electric Brakes and Clutches is highlighted in an 8-page bulletin. These devices use an electro-magnetic principle to provide a simpler, more versatile way to control a wide variety of machine motions. Included in the bulletin are complete specifications for primary electric brakes, clutches, and clutch-brakes; fractional horsepower "RF" electric brakes; "SF" electric clutches and clutch-couplings; and integral horsepower electric brakes and clutches. Copies of Form WEB 6212 can be obtained from Warner Electric Brake & Clutch Co., Beloit, Wis., or —
Circle Inform-A-Gram No. B24.

Consistent Duplication of Shape, keen sharp edges, and more workpieces per sharpening are some of the features of Model 3 tool sharpening machine. Although Model 3 Tool Sharpener is designed for use with Heald Bore-Matics, it can be applied to other carbide tipped tools used on other types of precision machines. Its features, specifications, and description are contained in Bulletin 2-4-2 issued by The Heald Machine Co., Worcester 6, Mass., or —
Circle Inform-A-Gram No. B25.

Profitable Product Design and Development are described in Bulletin PE-60 published by Pioneer Engineering & Mfg. Co., Inc., 19669 John R St., Detroit 3. Brief descriptions are used to show how the company's services can be used by manufacturers in producing goods that are economical to manufacture and have definite sales appeal. The bulletin also explains how the company's engineering facilities can be used to supplement those of any manufacturer.
Circle Inform-A-Gram No. B26.

NEW
Contour Gripping
FIXTURE

TAKE BIGGER CUTS
● FASTER
● SAFER
● CHEAPER

NO MORE BLOCKING SHIMMING
—
HOLDS ANY SHAPE IN ANY POSITION

THOUSANDS OF USES

This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

Investigate its possible application in your business. Write for further details or demonstration.

WRITE for Further Information Today

Act Now!

AMPOGRIP CORP.
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WILLIMANSETT, MASSACHUSETTS
CIRCLE INFORM-A-GRAM KEY NO. 123

Save Time and Money by improving marking operations or increasing stamp life expectancy with marking devices produced by Cadillac Stamp Co., 17315 Ryan Rd., Detroit 12. Bulletin SE 130 covers hand stamps, standard type fonts and sets, hand holders for interchangeable type inserts, machine stamping and embossing dies, symbol hand stamps and hammers, and steel letters and figures. Also given are the type size and holder specifications.
Circle Inform-A-Gram No. B27.

"A Convenient Guide to Automation Components and Control Systems" presents a complete picture of the products and services offered by Automatic Temperature Control for the field of automation. Some of the products covered are differential transducer control and automation systems, and a complete line of time control equipment. Copies of Catalog D-31 wil be sent on request to Automatic Temperature Control Co., Inc., 5200 Pulaski Ave., Philadelphia 44, or —
Circle Inform-A-Gram No. B28.

MELIN
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END MILLS
There is a difference in end mills . . . MELIN end mills! Proof of this is evident in the continued increase in MELIN popularity. The growth in MELIN tool acceptance was by no means an accident . . . The secret is in CONSISTENT QUALITY. This standard of Quality assures you better performance . . . longer lasting performance . . . CONTINUOUSLY . . . from one shipment to another. Next time you order end mills . . . specify the finest . . . specify MELIN.
MANUFACTURED IN TWO, THREE AND FOUR FLUTE TYPES.
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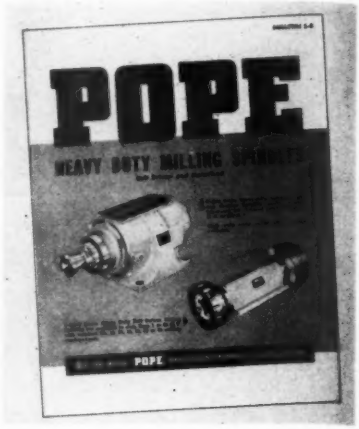
MELIN TOOL CO. INC.
CIRCLE INFORM-A-GRAM KEY NO. 124

A New Line of heavy duty belt driven milling spindles are available in a range of sizes from 1 to 50 hp with standard No. 10, 20, 30, 40, 50, or 60 milling machine noses. They are equipped with large precision



bearings and big shafts. Complete information on sizes, speed, and dimensions is contained in Bulletin S-8 which can be obtained from Pope Machinery Corp., 261 River St., Haverhill, Mass., or —
Circle Inform-A-Gram No. B29.

22 Reamer Styles, 29 end mill styles, 7 drill styles, and 10 carbide grades are covered in Catalog 55 now available from Wendt-Sonis, Hannibal, Mo. Included in the 92-page catalog is a complete new line of Shear Carb helically inserted end and shell mills. Also given is technical data, such as carbide manufacturers' grade recommendations, selection tables, operating data, resharpening directions, and grinding charts.
Circle Inform-A-Gram No. B30.

Grind Gages and other work where an extremely high degree of accuracy is demanded with the 6 x 12 hydraulic surface grinder. This grinder gives large machine performance at small machine cost. The grinder's features are detailed and its specifications listed in a folder put out by Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill., or —
Circle Inform-A-Gram No. B31.

Water Based Metalworking Products for machining, grinding, rolling, drawing, forming, and stamping are covered in a catalog made available by F. E. Anderson Oil Co., Dept. C, Portland, Conn. Described are the properties and uses of the Lusol line which includes improved Lusol K-7, Shamrock, Unikool, machine cleaner, G-3 germicide, rust preventive, and water conditioners.
Circle Inform-A-Gram No. B32.

Lathes are highlighted in comprehensive Bulletin C-56 released by The R. K. LeBlond Machine Tool Co., Madison and Edwards Rds., Cincinnati 8, O. Each type of lathe is shown, its features detailed, and the specifications listed. One section is devoted to the Hydra-Trace duplicating attachment which can be added to the lathes to increase their versatility. Also covered is the LeBlond-Carlstedt Rapid Borer.
Circle Inform-A-Gram No. B33.

"Get the Hole Story . . ." details the drill speeders, Series 2-100, 3-100, and 3-200, produced by The Ward-Riddle Co., Ravenna, O. The drill speeders facilitate small hole drilling on turret lathes. Catalog A-8 describes the various models and shows typical setups. The design of the speeder unit also allows for a maximum amount of interchangeability of parts and motors.
Circle Inform-A-Gram No. B34.

Aluminum Impact Extrusion reduces a complex assembly to a single, high-strength, smooth surfaced unit. In this process, the material is never stretched nor moved by tension as in drawing. A bulletin telling the advantages of aluminum impact extrusion over other methods, listing the physical properties and presenting drawings of aluminum impact extruded parts, is issued by Impax Inc., Ferguson 21, Mo., or
Circle Inform-A-Gram No. B35.

Trace without Touching with the Velvetrace Kellering Attachment. This unit is used for copying intricate forms in metal electronically. It can be adapted to most conventional milling machines or any other machine having a horizontal worktable, and longitudinal and cross feed motions. Complete details are in Circular 597 from Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or —
Circle Inform-A-Gram No. B36.

High Accuracy on Small Quantity Production without jigs and fixtures is possible with a new radial layout machine. It serves as a normal layout machine and also functions as a radial drill. Its features and specifications are detailed in a bulletin provided by The Fosdick Machine Tool Co., Cincinnati 23, O., or —
Circle Inform-A-Gram No. B37.

Indexing Turntables, controls, cams, and Geneva gear and barrel cam drives are found in Catalog 88-56 from Eisler Engineering Co., Inc., 750 S. 13th St., Newark 3, N. J. The catalog is complete with diagrams, illustrations, and descriptions.
Circle Inform-A-Gram No. B38.

Sliding Bed Gap Lathes have been designed for turning knee joints, shafts with large discs, and similar odd-shaped parts with extreme projections from the lathe center line. The lathes which are 32" x 100" and 32" x 125" can be pit or platform mounted. Complete dimensions, specifications, a list of special attachments, and application photos are presented in a bulletin from Axelson Mfg. Co., Div'n of U. S. Industries, Inc., 6160 S. Boyle Ave., Los Angeles 58, or —
Circle Inform-A-Gram No. B39.

Spring Force up to 8500 Lbs is a feature of Wales Hydra Springs using compressible liquids. These springs develop up to 600% more force than fixed loaded mechanical springs of similar dimensions. A catalog contains a basic description, properties, general specifications, applications, and installation diagrams. There is also a section on special designs. Get your copy of Catalog K from Wales Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y., or —
Circle Inform-A-Gram No. B40.

For Accurate ULTRA-SURFACES

not obtainable by any other finishing method, use . . .

Cogsdill
Bearing-izing* Tools

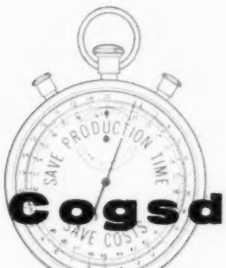
200,000 rapid-fire blows per minute from high-speed cam-operated peening rolls

*

A proven, precision process for surface finishing and sizing of holes, concentric flat surfaces, shafts, and many other contours.

For all metals of suitable ductility the peening action of the bearing-izer displaces and condenses machined surfaces, to produce more accurate, work-hardened, corrosion resistant surfaces easily lubricated and assembled.

Submit parts drawings for engineering recommendations.



Cogsdill TOOL PRODUCTS, INC.
12980 W. Eight Mile Road, Oak Park 37, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 125

Silicones which are effective as release agents in shell-mold manufacture are detailed in an 8-page booklet. Three different products are available to foundrymen as parting agents for shell molds: LE-46 Silicone Parting Emulsion, LS-46 Silicone Parting Solution, and L-46 Modified Silicone Stock. Copies of the booklet, "Union Carbide Silicones for the Shell Molding Process," are released by Union Carbide and Carbon Corp., Silicones Div'n, 30 E. 42nd St., New York 17, or —
Circle Inform-A-Gram No. B41.

General Facts on Metal Finishing are found in the first section of a reference booklet, "Metal Finishing Standards." Discussed are the purposes for various types of finish, thread fits, formulas for calculating thread sizes before plating, hydrogen embrittlement, etc. The second and third sections, arranged in tabular form, cover various types of plating and types of surface treatment. The Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn., will provide copies of Booklet G20, or —
Circle Inform-A-Gram No. B42.

"Same Day" Shipment

from Ex-Cell-O's huge stock of precision

Drill Jig Bushings

For your convenience, Ex-Cell-O maintains huge stocks of precision Drill Jig Bushings, and efficient expediting facilities which make possible "same day" shipment. This means orders are filled and dispatched from complete inventories in New York, Detroit, Los Angeles and London, Ontario, within a few hours after they are received!

Ex-Cell-O Drill Jig Bushings are made of oil-hardening bearing steel selected for its great wear resistance, and hardened in a new atmosphere-controlled furnace. Material, hardness, dimensional tolerances and finish measure up to the highest standards of quality.

Call, wire or write Ex-Cell-O for the world's finest, fastest and most complete bushing service!

This complete Bushing Guide pictures and describes A.S.A. standard bushings, lists hundreds of Ex-Cell-O bushings available from stock. Write for as many copies as you need.

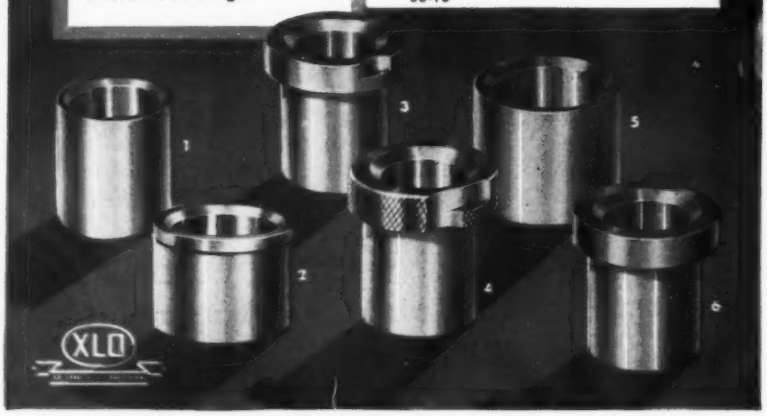
Ex-Cell-O Corporation

DETROIT 32, MICHIGAN

Manufacturers of Precision Machine Tools • Grinding Spindles • Cutting Tools • Railroad Pins and Bushings • Drill Jig Bushings • Aircraft and Miscellaneous Production Parts • Dairy Equipment

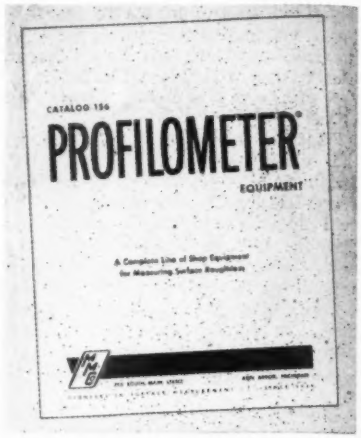
56-13

1. Headless Press Fit Bushings. 2. Head Liners. 3. Fixed Renewable Bushings. 4. Slip Renewable Bushings. 5. Headless Liners. 6. Head Press Fit Bushings.



CIRCLE INFORM-A-GRAM KEY NO. 126

Shop Measurement of Surface Roughness is performed by Profilometer equipment. A catalog arranged in sections covers equipment for manual operations, straightline mechanical tracing on hard-to-reach surfaces, and circular tracing; and portable equipment for straightline



mechanical tracing. Also described is equipment for recording microinch roughness readings and special equipment. Request copies of Catalog 156 from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., or —
Circle Inform-A-Gram No. B43.

A Fast Quench Oil, Sunquench 78, is featured in Technical Bulletin 45 from Sun Oil Co., Philadelphia 3. Explained are the mechanism of quenching and how Sunquench 78 gives deeper hardening of low-alloy steels and reduced distortion of irregularly shaped parts.
Circle Inform-A-Gram No. B44.

Tips on How to Order Shelving and plan installations in more than 1000 combinations to fit any storage or supply-handling need are summarized in a new catalog. Included are drawings of basic units and accessories, suggested floor plans, a shelf-capacity chart, and photos of completed units. Copies of the Shelving Catalog can be obtained from Hallowell Div'n, Standard Pressed Steel Co., Box 600, Jenkintown, Pa., or —
Circle Inform-A-Gram No. B45.

Standard and Special Purpose Pressure Test Machines for automotive, appliance, aircraft, etc. industries are described in a 4-page bulletin. A number of the machines are designed for inclusion in automation lines. Also included are units for checking parts and submerging those found defective for precise location of leaks. Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, will provide copies of Bulletin PT-1, or —
Circle Inform-A-Gram No. B46.

Cutters — half side milling, plain milling, and staggered tooth — are featured in Catalog 32 from Lovejoy Tool Co., Inc., Springfield, Vt. One section is devoted to replacement parts. The catalog will aid in the selection of cutters by providing ordering information, illustrations, diagrams, and descriptions.
Circle Inform-A-Gram No. B47.

The Applications of speed alloy steel plate are discussed and illustrated in Bulletin 543 issued by W. J. Holliday Co., Div'n of Jones & Laughlin Steel Corp., Indianapolis 7, Ind. In addition, physical property data, heat treating information, welding procedures, and a history of speed steels are given.
Circle Inform-A-Gram No. B48.

Cut Down Costly Mistakes and Stock Spoilage with Erick Magna-Holders and accessories. A dial test indicator, safety shield, and inspection light are among the accessories designed specifically for use with the Magna-Holder bases. Cullen Mfg. Co., Racine, Wis., will provide copies of Catalog 755, or —
Circle Inform-A-Gram No. B49.

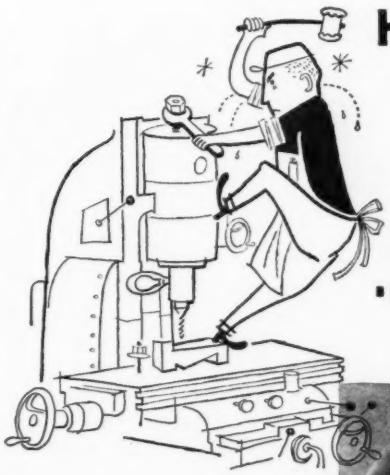
Products Using Perforated Metals are shown in a catalog from Standard Stamping & Perforating Co., 3109-65 W. 49th Pl., Chicago 32. Also given are tables of weights and gauges and other technical data. The catalog contains information on ordering, fabrication, and the materials that can be perforated. The company has production facilities for perforating, bending, forming, welding, tooling, painting, and finishing.
Circle Inform-A-Gram No. B50.

"Meeting Automation's Challenge in Fastening Methods." This brochure deals with automatic multi-head riveters for the fastening operation in fully automatic systems. These riveters speed up production by automatically feeding and setting more rivets in every machine cycle, thus reducing the number of operations required. For your copy of the brochure, contact Tubular Rivet & Stud Co., Wollaston (Quincy) 70, Mass., or —
Circle Inform-A-Gram No. B51.

Automated Centralized Lubrication Systems are detailed in Bulletin 806-R from Lincoln Engineering Co., 5701 Natural Bridge Blvd., St. Louis 20, Mo. These systems will automatically apply either viscous or fluid lubricants to bearings on individual machines at predetermined, self-controlled time intervals.
Circle Inform-A-Gram No. B52.

Hydraulic Power Units, Hydraulic Index Tables, mechanical index tables, multiple drill heads, and multiple lead screw tapping heads are among the machine tools covered in a 12-page bulletin. Also included are dual angle tapping heads, gun drilling machines, and standard and special machines. The machine tools are described and illustrated in Bulletin 54 published by Crescent Tool & Machine Co., Inc., 1780 Southfield Rd., Lincoln Park 25, Mich., or —
Circle Inform-A-Gram No. B53.

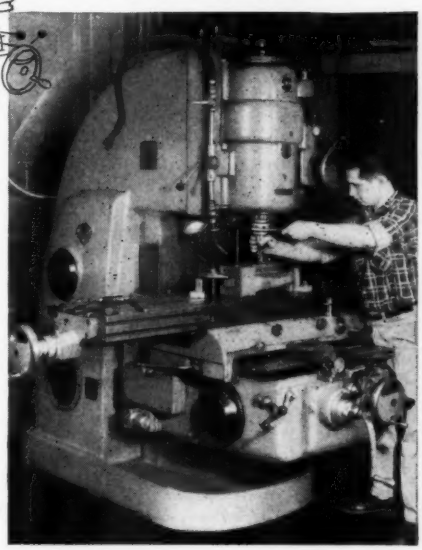
A "Preview" of the new Littell Catalog is now available to users of feeding equipment for punch presses and reels, and straightening machines for coil stock. The 28-page "Preview" pictures and describes the contents of each of 24 new bulletins on Littell equipment, available as individual bulletins or bound together into a complete catalog. Copies of the "Preview" are supplied by F. J. Littell Machine Co., 4127 N. Ravenswood Ave., Chicago 13, or —
Circle Inform-A-Gram No. B54.



HOW MODERN IS *YOUR* METHOD?

...THIS

... or *THIS*



The modern P.D.Q. tooling method completely eliminates the time lost in changing old fashioned type tools. No more "sweating out" loosening and tightening the draw bolt. A 60° turn of the lock nut and you're ready for another tool. P.D.Q. tool changes are only a matter of seconds . . . and tools are available in very small, small, medium and large series depending on the application. Write for literature covering all the advantages of modern, cost cutting P.D.Q. (Portage Double Quick) tooling.

REPRESENTATIVES IN PRINCIPAL CITIES

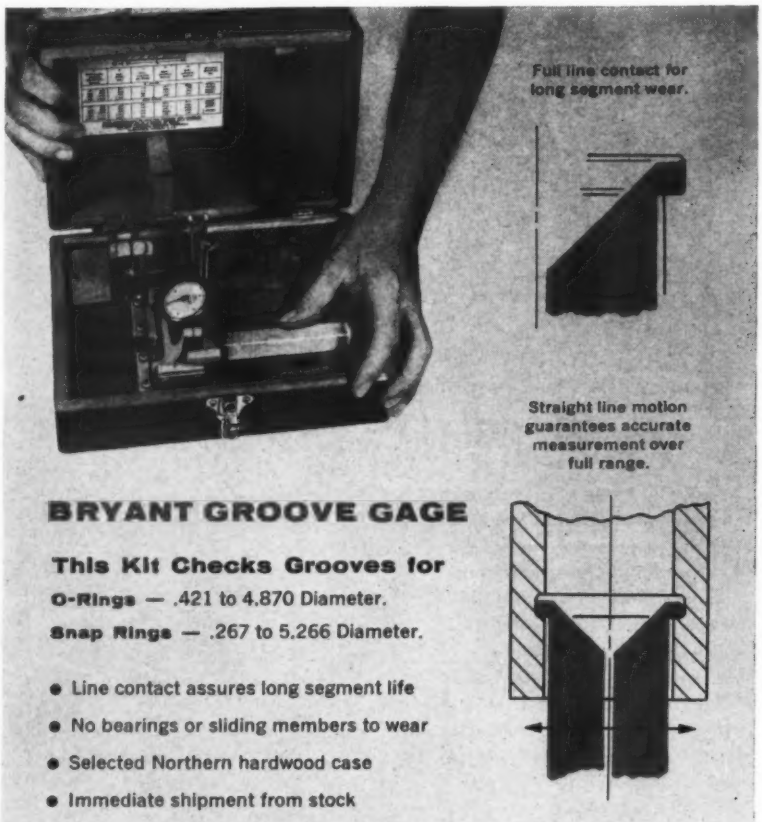
PORTAGE Double-Quick TOOL CO.

1046 SWEITZER AVENUE • AKRON 11, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 127

Reduce Material Handling Time and Labor with gravity roller conveyors produced by Harry J. Ferguson Co., Jenkintown, Pa. The complete line is presented in Bulletin 100, including photos and descriptions of the two-in-one conveyor, special gravity roller conveyors, gravity roller conveyor bearings, and aluminum conveyors. In addition, specialty items are illustrated and described. Also given are photos of the various types of the conveyors in use.
Circle Inform-A-Gram No. B55.

Drill and Countersink Holes to close tolerances (5/32" to 3/8") in straight and spray pattern operations, in seconds with the Spacematic Drillmotor. It eliminates all secondary operations including reaming. Adjustable foot guides, permanent gauges, and interchangeable mandrel sizes and feet combine to make the Spacematic flexible in application and use. Details are found in a bulletin from Winslow Product Engineering Corp., 47 St. Joseph St., Arcadia, Calif., or —
Circle Inform-A-Gram No. 56.



BRYANT GROOVE GAGE

This Kit Checks Grooves for

O-Rings — .421 to 4.870 Diameter.

Snap Rings — .267 to 5.266 Diameter.

- Line contact assures long segment life
- No bearings or sliding members to wear
- Selected Northern hardwood case
- Immediate shipment from stock

Special segments available for checking non-standard grooves, concentricity of groove to bore, or depth of groove to face.

Groove segments can also be used on the Bryant B-21 Bench Gage.

WRITE FOR FULL INFORMATION ON BRYANT GAGES

Bryant Gage & Spindle Division

P. O. Box 620-F, SPRINGFIELD, VERMONT

Division of Bryant Chucking Grinder Company

CIRCLE INFORM-A-GRAM KEY NO. 128

Reduce Costs in many types of mass assembly with the new Model 400 power screwdriver. It can be operator-controlled and then converted to fully automatic operation when required. This power screwdriver can drive as many as 60 screws/min. Details on the screwdriver are given in an illustrated booklet provided by Shakeproof Div'n, Illinois Tool Works, Power Screwdriver Dept., 2501 N. Keeler Ave., Chicago 39, or —
Circle Inform-A-Gram No. B57.

The Types, Uses, and Advantages of Subland tools are described in a 28-page catalog offered by Mohawk Tools, Inc., 910 E. Main St., Montpelier, O. Pointed out are applications where the tools can be used to increase production rates and reduce operating and tooling costs. Included is a description of the many different types of Sublands that are manufactured and the operations that are possible to combine on a single tool.
Circle Inform-A-Gram No. B58.

Quicker, Easier Setups are possible with Universal vises and work holding fixtures. Included in a descriptive brochure are a 3-way vise, lathe fixture, mill vise, and work holders. The brochure contains large illustrations of each item pointing out the main features. Also described are a precision angle plate, 2 machine vises, and "Man-Sized" parallel clamps. Catalog 9155 is issued by Universal Vise & Tool Co., Parma, Mich., or —
Circle Inform-A-Gram No. B59.

A 3 Dimension Tracer Milling Unit has been designed for taking numerous cuts on large workpieces by moving the cutter instead of the workpieces. The unit is self-contained and can be moved to many different positions to make intricate cuts in transverse, longitudinal, or vertical directions. For complete details on the tracer milling unit, request Form 3D-1 from Sundstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill., or —
Circle Inform-A-Gram No. B60.

The Designer's Guide for Electric Resistance Welding is Bulletin 331 available from Sciaky Bros., Inc., 4915 W. 67th St., Chicago. The bulletin deals with overall design considerations and types of resistance welding. Specific fastening methods discussed in detail are spot, seam, projection, and flash-butt welding. One section is devoted to listing the free literature available with a brief description of each publication.
Circle Inform-A-Gram No. B61.

The Advantages of Magne-Speed variable speed drives are listed in Bulletin S580-5-55 from Magnetic Amplifiers, Inc., 632 Tinton Ave., New York 55. Also given are the specifications and schematic drawings for Sizes I and II drives. Magne-Speed controls are non-electronic and therefore instant starting.
Circle Inform-A-Gram No. B62.

Ram Type Universal Turret Lathes are featured in Bulletin 1174-B issued by Gisholt Machine Co., Madison 10, Wis. Given are the specifications, features, accessories, tools, and floor plans for the line of Masterline lathes. A fold-out page gives a general machine view of the No. 4 universal turret lathe.
Circle Inform-A-Gram No. B63.

Details on Stake Nuts and Cage Nuts are found in circulars issued by Prestole Corp., 1345 Miami St., Toledo 5. The stake nuts which are used for mounting metal parts or panels, are designed for heavy-duty applications. The cage nuts are high strength, heavy-duty fasteners with many advantages for blind location assembly.
Circle Inform-A-Gram No. B64.

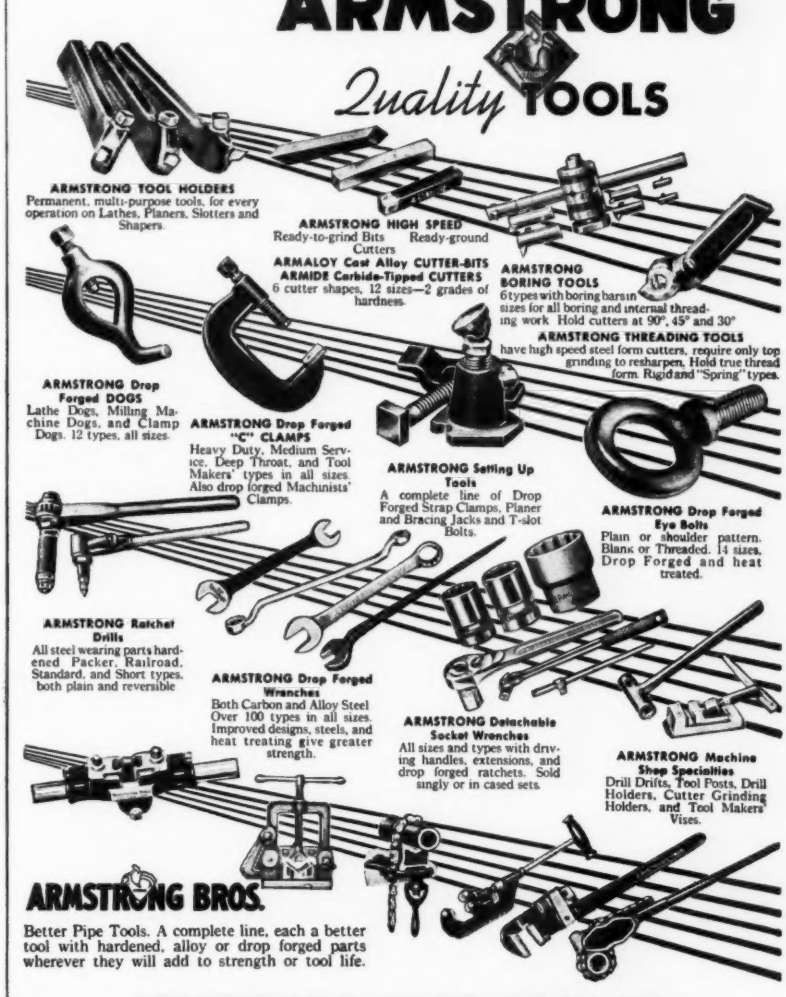
Modernize Hand Turret Lathes with a hydraulic turret drive. The drive increases production and reduces costs by eliminating hand indexing and traversing. It can be adapted to any standard ram-type turret lathe Nos. 1, 2, 3, 4, and 5. A. W. Cash Co., P. O. Box 551, Decatur, Ill., will supply Bulletin S-740 detailing the drive, or —
Circle Inform-A-Gram No. B65.

Stroke and Revolution Counters which count life ratings from one billion to three million are described in Catalog M200 from Production Instrument Co., 714 W. Jackson Blvd., Chicago 6. Special counter assemblies for built-in applications are shown as well as an extensive assortment of individual number wheels, reset gears, and shafts.
Circle Inform-A-Gram No. B66.

Milling, Planing, Shaping, Tapping, etc., and bench operations are facilitated by the multi-purpose, air or hydraulic Airlox vise. The vise can be operated manually or synchronized with the movement of the milling machine table or drill press spindle. Production Devices, Inc., Whitehall, N. Y., will provide a circular with information on the vise, or —
Circle Inform-A-Gram No. B67.

Produce Large Sprockets and Gears Automatically with the Cogmatic Precision Flame Machining Process. Machining is automatic and accurate to tolerances ranging from ±0.007" on smaller sprockets to ±0.015" on larger sprockets and gears. Any size up to 100" dia and to 3" thick can be machined. For more information, obtain a copy of the bulletin, "Exclusive Cogmatic Precision Flame Machining," from Seaman-Andwall Corp., Cogmatic Div'n, 305-18 N. 25th St., Milwaukee 1, or —
Circle Inform-A-Gram No. B68.

Locate and Retain Drill Jig Bushings without Distortion of the jig plate or misalignment of the hole pattern with BK No. 7 cement. This cement is used in the construction of complicated assemblies requiring irregularly shaped tools. It eliminates lapping of press fit bushings after assembly. Bushings can be retained in steel, aluminum, or fiberglass jigs. An engineering data folder on the cement is supplied by Sheridan Products, Inc., 1054 E. Hyde Park Blvd., Inglewood 3, Calif., or —
Circle Inform-A-Gram No. B69.


ARMSTRONG
Quality TOOLS
ARMSTRONG TOOL HOLDERS
Permanent, multi-purpose tools, for every operation on Lathes, Planers, Slotters and Shapers.
ARMSTRONG HIGH SPEED
Ready-to-grind Bits Ready-ground Cutters
ARMALOY Cast Alloy CUTTER-BITS
ARMIDE Carbide-Tipped CUTTERS
6 cutter shapes, 12 sizes—2 grades of hardness.
ARMSTRONG BORING TOOLS
6 types with boring bars in sizes for all boring and internal threading work. Hold cutters at 90°, 45° and 30°
ARMSTRONG THREADING TOOLS
have high speed steel form cutters, require only top grinding to resharpen. Hold true thread form. Rigid and "Spring" types.
ARMSTRONG Drop Forged DOGS
Lathe Dogs, Milling Machine Dogs, and Clamp Dogs. 12 types, all sizes.
ARMSTRONG Drop Forged "C" CLAMPS
Heavy Duty, Medium Service, Deep Throat, and Tool Makers' types in all sizes. Also drop forged Machinists' Clamps.
ARMSTRONG Setting Up Tools
A complete line of Drop Forged Strap Clamps, Planer and Bracing Jacks and T-slot Bolts.
ARMSTRONG Drop Forged Eye Bolts
Plain or shoulder pattern. Blanks or Threaded. 14 sizes. Drop Forged and heat treated.
ARMSTRONG Ratchet Drills
All steel wearing parts hardened. Packer, Railroad, Standard, and Short types, both plain and reversible
ARMSTRONG Drop Forged Wrenches
Both Carbon and Alloy Steel. Over 100 types in all sizes. Improved designs, steels, and heat treating give greater strength.
ARMSTRONG Detachable Socket Wrenches
All sizes and types with driving handles, extensions, and drop forged ratchets. Sold singly or in cased sets.
ARMSTRONG Machine Shop Specialties
Drill Drifts, Tool Posts, Drill Holders, Cutter Grinding Holders, and Tool Makers' Vises.
ARMSTRONG BROS.
Better Pipe Tools. A complete line, each a better tool with hardened, alloy or drop forged parts wherever they will add to strength or tool life.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. ARMSTRONG AVENUE CHICAGO 30, ILL.
CIRCLE INFORM-A-GRAM KEY NO. 129

"What You Should Know about Expendable Pallets" is a guide to pallet purchasers in determining the principles involved in the construction and use of such pallets. Included is data on the types of expendable pallets, construction standards for pallet parts and fastenings, and allowable tolerances. Also provided is an application rule and a list of definitions and terms. For your copy, write to The National Wooden Pallet Mfg. Association, 609 Barr Bldg., Washington 6, D. C., or —
Circle Inform-A-Gram No. B70.

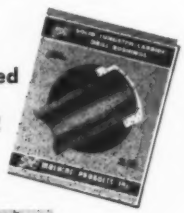
Keyless Drill Chucks are tightened automatically without a key or wrench. Models and adapters are produced for all portable drills, single and multiple spindle or radial drill presses, and engine and turret lathes. The "Knock-Out" Keyless Chucks are available in 5 sizes providing a range from 0 to ⅞". For a copy of Form AI-DC giving specifications, features, typical applications, and disassembly information, contact K. O. Lee Co., First Ave. S.E. at Congress, Aberdeen 1, S. Dak., or —
Circle Inform-A-Gram No. B71.

S&E solid carbide drill bushings

A.S.A. Standard
fully interchangeable with Standard Steel Bushings

S & E bushings are precision ground and lapped to exacting finish and tolerance, yielding the highest bushing performance with long life, (more than 50 times the life of steel bushings). This in turn cuts down-time to a minimum, increases tool wear life and provides the users with the highest quality bushing at the lowest production cost.

Ask for illustrated bulletin No. 102



S&E MACHINE PRODUCTS INC.
Plant and General Offices: Bridgeport, Michigan
Sales Offices in all Principal Cities

CIRCLE INFORM-A-GRAM KEY NO. 130

Slip Spindle Assemblies, drill and tap drivers, spindle extension assemblies, adapters, and turret tool holders are among the production holding tools described in a circular. Also included is the new Trepan-Designed tension or compression adjustable tap driver which features a trepan clamp that speeds tap changes. Copies of the circular, "Specify Seibert for Extra Precision," can be obtained from Seibert & Sons, Inc., Chenoa, Ill., or —
Circle Inform-A-Gram No. B72.

Low Cost Milling Operations are performed by Powermatic milling machines. They are designed to take 7½ hp cuts on medium sized parts manufactured in almost any quantity. Their highlights of design, features, control elements, dimensional drawings, general specifications, and standard and extra cost equipment are found in Publication M-1913 made available by The Cincinnati Milling Machine Co., Cincinnati 9, O., or —
Circle Inform-A-Gram No. B73.

Eliminate Many Problems connected with checking tapered holes by using the taper hole gage. The correct taper as well as the out of round condition can be checked while the workpiece is still on the grinder. The gage has an accuracy within 0.00005". Details are in a circular from AA Gage Co., 350 Fair St., Detroit 20, or —
Circle Inform-A-Gram No. B74.

Micro Control for Hydraulic Systems is provided by the Hague hydraulic relay. This precision relay can be installed in any position and requires no adjustment. The relay's operating principle, actual performance curves, and a dimensional diagram are contained in a bulletin available from Hague Regulator Corp., Orangeville, O., or —
Circle Inform-A-Gram No. B75.

Balsa as a Core Material in sandwich construction is treated in a folder released by International Balsa Corp., 106 Boyd Ave., Jersey City, N. J. Given are the advantages of using balsa wood, its strength, exposure test results, the effects of temperature on balsa sandwich construction, and some of its uses and advantages.
Circle Inform-A-Gram No. B76.

60% More Chip Capacity is provided by the Metcut Pin-Mount Core Drill. This drill is an improved 2-piece tool designed with deeper flutes, that is available in sizes from ¾" to 5" dia. It features quick, easy-to-change cutters. Metal Cutting Tools, Inc., Rockford, Ill., will supply copies of a brochure containing details on the drill, or —
Circle Inform-A-Gram No. B77.

Positive, Accurate Calibrations to 0.0001" on diameters without backlash are possible with Deka-Bore boring heads and bars. The boring heads and bars are used on horizontal, vertical, and special boring machines for rotating or fixed applications. The features and instructions for care and use are found in a bulletin from Precision Tool & Mfg. Co. of Ill., 1305 S. Laramie Ave., Cicero, Ill., or —
Circle Inform-A-Gram No. B78.

11 Types of Solid Carbide End Mills for rough and finish machining of ferrous, non-ferrous, and non-metallic materials are now offered by M. A. Ford Mfg. Co., Inc., 732 W. River St., Davenport, Iowa. Extra long flutes are machine ground for faster cutting, better finish, and long life. The complete line of solid carbide end mills is featured in Bulletin 510 made available by the company, or —
Circle Inform-A-Gram No. B79.

Mark Cylindrical or Cone-Shaped Parts with a high-speed rotary table marking machine. No. 201 machine operates at a rate of from 6000 to 7000 marked parts/hr. Features, principles of operation, construction methods for special applications, and specifications are found in the brochure, "Matthews No. 201 Rotary Table Marking Machine," from Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13, or —
Circle Inform-A-Gram No. B80.

Convert Any Lathe to a high-speed, semi-automatic production machine with the Exactomatic lathe attachment. It holds zero taper on production runs and triples lathe output. For a circular containing an enlarged drawing pointing out the attachment's features, contact Fred H. Schonberger, Inc., P.O. Box 233, Nazareth, Pa., or —
Circle Inform-A-Gram No. B81.

Constant Accuracy is a feature of Lincoln Park dial snap gages. These gages will give a direct reading from the measuring anvil to the indicator. A complete range of sizes and types is available. The gages are detailed in a circular published by Lincoln Park Industries, Inc., 1719 Ferris Ave., Lincoln Park 25, Mich., or —
Circle Inform-A-Gram No. B82.

Eliminate the Distorting Action of Conventional Clamps with Kant-twist clamps. These clamps weigh approximately half as much as comparable conventional clamps yet are 40% stronger. Diagrams, specifications, and details are in a catalog sheet issued by Saxton Mfg. Co., Inc., 1517 Potrero Ave., El Monte, Calif., or —
Circle Inform-A-Gram No. B83.

Operation of an Automatic Assembly Machine is described in a brochure published by Multra Corp., subsidiary of Barnes Engineering Co., Stamford, Conn. By changing the tooling, the machine can be adapted to assemble multi-component assemblies such as electrical relays, etc. The brochure details the complete part-by-part assembly of a single product. Also shown and explained are the construction of the machine and position of the tools and vibratory feeders around the work table.
Circle Inform-A-Gram No. B84.

A Modern Solution to an old machining problem is supplied by equalizing gang vise jaws manufactured by A. L. Dery and Sons Tool and Die Co., Pine Meadow, Conn. The jaws are completely equalizing, allowing the machining of from 2 pieces to the capacity of the vise which varies in proportion to its length. The milling and grinding jaws to be used with a non-magnetic setup are made to suit the customer's vise. The company will supply literature with complete details on the jaws.
Circle Inform-A-Gram No. B85.

Scully-Jones
PREMIUM QUALITY SLEEVES, SOCKETS
now even better!

New "keyhole-type" drift slot eliminates the need for hammering on conventional drift and speeds tool ejection.

These benefits . .	for these reasons	. . . result from these PREMIUM features
INCREASED ACCURACY	Zero run-in in the machine spindle	1. Precision-finished to high degree of concentricity.
		2. Hardened surfaces resist nicking and burring.
INCREASED PRODUCTION	Faster tool changes	3. Properly hardened and precision-ground surfaces assure perfect fit in spindle.
	Guard against cutting tool breakage	4. New "keyhole-type" drift slot simplifies ejection of chucks and tools—eliminates pounding.
	Longer tool life	5. Outlast several soft sleeves or sockets—proper steel and hardness prevent twisting, nicking, and spindle damage.
REDUCED TOOL COSTS	Adapt your present machines and cutting tools for wide range of operations	6. Convert any Morse Taper hole and shank to a smaller or larger taper.
		7. Three series of sockets and turret tool holders extend spindles and turrets to reach otherwise inaccessible machining locations.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS
"Precision Holding" for holding precision

Scully-Jones and Company, 1913 South Rockwell St., Chicago 8, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 131

Difficult Bonding Problems involving materials such as metals, glass, thermosetting plastics, etc. are solved with epoxy resin adhesives. They have tensile shear strengths up to 4500 lbs/sq in with steel and 3000 lbs/sq in with aluminum. A brochure contains technical data and price information on the adhesives. Information is also given on a new line of epoxy resin formulations. Copies of the brochure are supplied by Armstrong Products Co., Dept. 1-TP, Warsaw, Ind., or —
Circle Inform-A-Gram No. B86.

Dimensional Drawings and Specifications are used to describe blanks, inserts, carbide tipped tools, Gammax tool holder, combination cutters, shell end mills, and twist drills in a 32-page catalog. The reference catalog covers the complete line of Coromant carbide tool products. Various sections list the standard grades, carbide manufacturers' grade recommendations, etc. Write to Sandvik Steel, Inc., Coromant Div'n, 1702 Nevins Rd., Fair Lawn, N. J., for copies of the Coromant Catalog, or —
Circle Inform-A-Gram No. B87.

PIVOT punch introduces cylindrically ground punches with *MORE QUALITY* features than *EVER BEFORE*

HIGH SPEED STEEL
Greater impact strength and wear-resistance.
GUARANTEED CONCENTRICITY
between point and shank within .0002, T.I.R.
LEAD GROUND ON THE SHANK
for perfect alignment in retainer holes.
HOT HEAD FORGING
(On Shoulder Punches) eliminates head fracture.
48-HOUR DELIVERY
Complete stock of all standard sizes.
HIGHEST Quality AT LOW PRICES
The SAME prices as competitive punches!

NOW! 48 Hour (IN STOCK) Delivery!

WRITE FOR COMPLETE CATALOG WITH PRICE LISTS

tondra-treated FOR EXTREME HARDNESS

pivot punch and die corp.
NORTH TONAWANDA, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 132

Increase Cylindrical Grinding Production 200% with the Dead Eye Center-All chuck work head. With this device, one operator can run 2 machines at the same time. The chuck work head has a range from 3/32" to 27/32" with only one set of interchangeable jaws. Modern Devices, Box 429, Libertyville, Ill., will supply a circular with details, or —
Circle Inform-A-Gram No. B88.

Thread Triangle Gages will measure threads as accurately as the 3-wire method. These thread triangles are hardened precision-ground gages in the form of two 60° triangular bars. For details on how to use the thread triangles and their advantages, get a circular from Montgomery Tool Co., 7 Tichenor Lane, Newark 5, N. J., or —
Circle Inform-A-Gram No. B89.

"Fenn Rolling Mills" is a catalog containing complete information on a standard line for rolling ferrous and non-ferrous metals in the form of sheets, strips, wire, or rods. In addition to detailing the mills, giving features, photos, and specifications, the catalog discusses lubrication and maintenance. The Fenn Mfg. Co., Newington, Conn., or —
Circle Inform-A-Gram No. B90.

High Speed Full Muffle Furnaces for temperatures to 2400°F have been designed primarily for high carbon and alloy steels. These "Super Heat" atmospheric oven furnaces need no power or blower, just connect them to the gas supply. A folder from Charles A. Hones, Inc., Baldwin, N. Y., contains full details on the furnaces, or —
Circle Inform-A-Gram No. B91.

Full Floating Tool Holders automatically compensate for parallel and angular misalignment. These tool holders are self-centering; eliminate bellmouthing, chatter, and oversize holes; and cut setup costs. The Toolflex holders float by means of oil, heat, and wear resistant Neoprene inserts. Their sizes and specifications are listed in a folder made available by Burg Tool Mfg. Co., Inc., P. O. Box 48, Gardena, Calif., or —
Circle Inform-A-Gram No. B92.

3-Dimensional Illustrations in a new brochure show the difference between Chase die-pressed brass forgings and brass sand castings. Chase forgings are recommended for mechanical assemblies because their close accuracy makes parts interchangeable, eliminating hand filing and fitting. Get your copy of the 3-D Brochure from Chase Brass & Copper Co., Waterbury 20, Conn., or —
Circle Inform-A-Gram No. B93.

Feeds up to 2700 Screws/Hr are possible with an automatic socket set screw feeder and driver. This machine will hopper feed and insert standard socket set screws with a power screwdriver. All screws are automatically righted and fed to the power screwdriver with the point headed in the right direction. The Bristol Co., Socket Screw Div'n, Waterbury 20, Conn., will issue Bulletin 738 with details, or —
Circle Inform-A-Gram No. B94.

Precision Duplicating and Profiling on Bridgeport millers can be performed by a fluid motion duplicator table. The Regent duplicator can also be used on any horizontal or vertical mill equipped with a Bridgeport milling head and round overarm. For more information, get a bulletin from J. M. Kalins & Co., 1575 Railroad Ave., Bridgeport 5, Conn., or —
Circle Inform-A-Gram No. B95.

Model 400-N High Pressure Hydraulic Die Casting Machine is the subject of a bulletin from The Cleveland Automatic Machine Co., Cincinnati 12, O. The machine features fast die closing and opening action, automatic timing of casting cycle, and easy adjustment and operation. It is designed to produce precision quality castings at a highly profitable rate of production.
Circle Inform-A-Gram No. B96.

Tooling Specialties for jigs, fixtures, and dies are featured in Catalog 56 published by Vlier Engineering, Inc., 8900 Santa Monica Blvd., Los Angeles 46. These standardized component parts save toolmaker's time, speed setups, and increase machining accuracy. Covered are torque thumb screws, spring plungers, swivel-pad clamps, fixture keys, spring stops, and toggle pads.
Circle Inform-A-Gram No. B97.

Cylinders and Valves are detailed in a comprehensive catalog put out by Logansport Machine Co., Inc., Logansport, Ind. Catalog 100 describes the various types of stationary and rotating air, Logansquare, Ultramation, and Air-Draulic cylinders. One section is devoted to air control valve and accessory equipment.
Circle Inform-A-Gram No. B98.

"Used in All Industries . . . Everywhere!" describes the Palmgren vises; and milling, rotary, and indexing tables produced by Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17. Also included are milling attachments for use on engine lathes. Get your copy of illustrated Catalog 204 from the company, or —
Circle Inform-A-Gram No. B99.

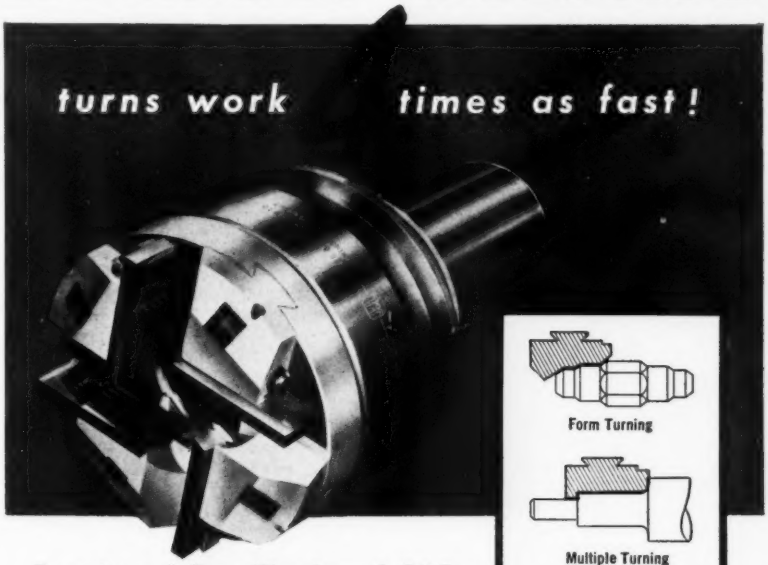
A 5-Ton Power Bench Type Punch Press, Model B-5, is the subject of a circular issued by Alva Allen Industries, Punch Press Dept., 1001-1015 N. 3rd St., Clinton, Mo. The operating features are described and illustrated and the specifications listed.
Circle Inform-A-Gram No. B100.

Jig and Fixture Hardware is featured in a folder from Goe Engineering Co., 219 S. Mednik Ave., Los Angeles 22. Diagrams and specifications are presented for quarter turn screws, rest buttons, hardened jig feet, thumb screws, and swing bolts. Also given is a price list.
Circle Inform-A-Gram No. B101.

All Metal Shock and Vibration Control Mountings for smoother, quieter operation of machine tools, etc. are the subject of Bulletin 1000 supplied by Robinson Aviation, Inc., Teterboro, N. J. The new concept of all metal mountings with stainless steel cushions is explained plus the advantages of Met-L-Flex resilient elements over less durable rubber, cork, felt, and synthetic elements. Illustrations, dimensions, and load ranges of tested mounts and their recommended applications are also included.
Circle Inform-A-Gram No. B102.

Die Head
HOLLOW MILLING

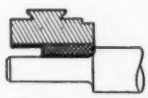
turns work times as fast!



In most cases, hollow milling chasers in J & L Die Heads will do plain turning, multiple turning and contour forming four times faster than any single point tooling method. (Each of the four chasers in the set does the work of a single point tool.)

Form Turning

Multiple Turning


Turn and Face with Carbide

Carbide chasers in J & L Die Heads have reduced hollow milling time still another 80% over H.S.S. chasers, while holding surfaces to 10 RMS.

Important!

Money-saving hollow milling chasers are held in the same J & L Die Heads that guarantee Class III threads — every time.

write for folder #5433

JONES & LAMSON

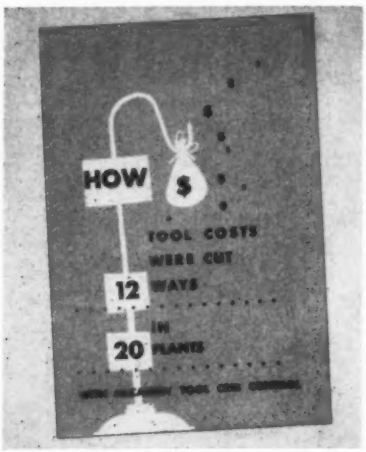
Class III Guaranteed Not Sometimes, but Everytime!

JONES & LAMSON MACHINE COMPANY, 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 133

SHOP

"How Tool Costs Were Cut 12 Ways in 20 Plants" discusses the savings resulting from the use of McCaskey Tool Crib Control. The booklet is a report of results and how they have been secured and doesn't include details of operating procedures. It tells how the system stops loss and theft, results in immediate savings, cuts tool purchases by reducing crib inventories, cuts waiting time, reduces replacement



purchases, and means no disputes and less work for tool crib attendants. Incorporated in the discussion are actual statements of the accuracy and effectiveness of the system by companies now using it. For details on the McCaskey Tool Crib Control, get the booklet from Victor Adding Machine Co., McCaskey Industrial Div'n, 3900 N. Rockwell St., Chicago 18, or — **Circle No. C1.**

Simplified Welding Procedures for every base metal are featured in a 140-page Pocket Data Book. Covered are 120 welding rods, electrodes, and welding compounds. The booklet is a guide to improved torch and metallic arc welding, brazing, and soldering. Weld preparation steps are given for all metals, as well as the lowest possible application base metal heats for each base metal, filler metal, flux, and joint design. Also included are many welding applications for every industry. Copies of Data Book TIS 2575 are provided by Technical Information Service, Eutectic Welding Alloys Corp., 40-40 — 172nd St., Flushing 58, N. Y., or — **Circle Inform-A-Gram No. C2.**

Carbide Gun Drills are featured in a folder, Form 200, from Chicago-Latrobe, 411 W. Ontario St., Chicago 10. These tools are designed for applications such as drilling long shaft

oil holes in connecting rods, etc. Technical data is included in the folder along with an engineering print. **Inform-A-Gram No. C3.**

The Use of Ethyl Silicate for Precision Casting is detailed in an 18-page technical booklet. Described are the hydrolysis, gelation, setting, and hardening of ethyl silicate; precoat and investment preparation; and typical formulas. Also included are solutions of typical investment casting problems; and analysis, specifications, and prices for Montrose ethyl silicates. The booklet can be obtained from R. W. Greeff & Co., Inc., 10 Rockefeller Plaza, New York 20, or **Circle Inform-A-Gram No. C4.**

This Sheet Metal Weight Calculator gives the weight/lineal ft instead of weight/sq ft. It has been redesigned for the calculation of overall weight sheet metal. The slide rule is adapted to all punch press stamping operation where it

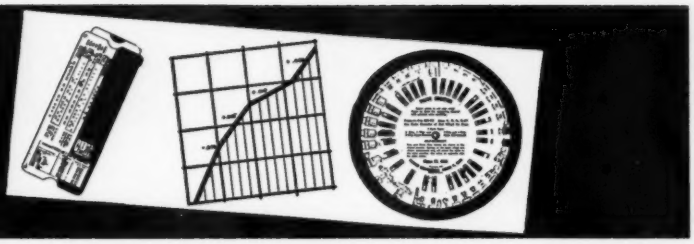
is necessary to determine accurately the weight of a number of parts/lineal ft on an overall given number of stampings. For a copy of the calculator, contact Dayton Rogers Mfg. Co., Minneapolis 7, or — **No. C5.**

The Second Edition Torque Manual has been completed by P. A. Sturtevant Co., Addison, Ill. This expanded manual includes additional torque application formulas. There are also more suggested application illustrations. Tables show screw torque data including minimum torsional strength tabulations and torque conversion. There are also torque and tension relationship charts for high tensile and mild steel screws. Explanations and solutions

to adapter problems, illustrations of special torque wrench adapters and attachments, and more complete information on the general principles of torque wrenches are covered. The technical publication on torque problems is written in an easy-to-understand manner. The manual will be of value to planning people, project engineers, draftsmen, engineers in all fields, production engineers, foremen, operators, and other individuals in many other phases of industry. **Circle Inform-A-Gram No. C6.**

"The Involute Curve and Involute Gearing" covers the application of the involute curve to gear teeth. Also detailed are the design, cutting, and checking of involute gears; and definitions of gear-tooth elements. A section with material on gear design includes formulas and data on methods for determining involute and fillet interference, continuity of tooth action, slippage of gear teeth, bearing loads, backlash, involute tooth modifications, relationship of pressure angle to interchangeability, and tooth contact. The Fellows Gear Shaper Co., Springfield, Vt., will supply copies of the booklet, or — **Circle No. C7.**

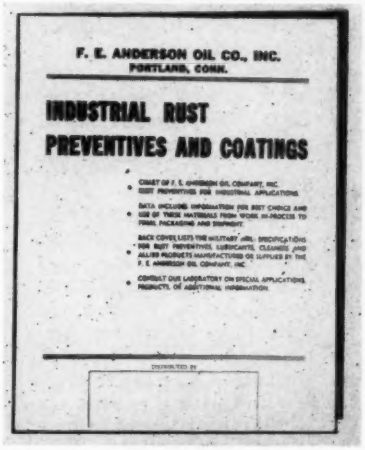
P AIDS



"The Tru-Cast Handbook" contains data on how and when to use beryllium copper mold components. Beryllium copper cavities are used in injection and compression molding, zinc die casting, and stamping dies. The handbook is a review of beryllium copper and the industrial advances it has made possible, a summary of present applications, and a preview of future potentials. It contains specific data, tabulations, charts, and a glossary of terms. The discussion follows through from customer design to Manco casting. Also covered are finishing techniques, heat treatment, and ordering procedure. The normal $2.00 charge will be waived for those companies engaged in molding or related activity. Write to Manco Products, Inc., 2401 Schaefer Rd., Melvindale, Mich., or — **Circle C8.**

Vacuum Forming with Hydrocal and Ultracal is detailed in Bulletin ITT-55 released by United States Gypsum, Industrial Sales Div'n, 300 W. Adams St., Chicago 6. Molds made from these gypsum cements are used for prototype and production applications. The brochure describes several techniques that can be used to make molds and forms for vacuum forming plastic sheet materials. Shown are the techniques for fabricating molds and forms quickly and inexpensively. Included are reinforcing vacuum forming models and suggested reinforcing designs. Also discussed are precast vacuum holes, surface coatings for Hydrocal and Ultracal gypsum cement models, and suggested drying cycles. **Inform-A-Gram No. C9.**

A Rust Preventives and Coatings Data Chart describes 12 different products for different uses. This group of products forms a complete rust preventive service from work in process to final packaging and



shipment. To obtain copies of the data chart folder, write to F. E. Anderson Oil Co., Inc., Dept. RP, Portland, Conn., or — **Circle C10.**

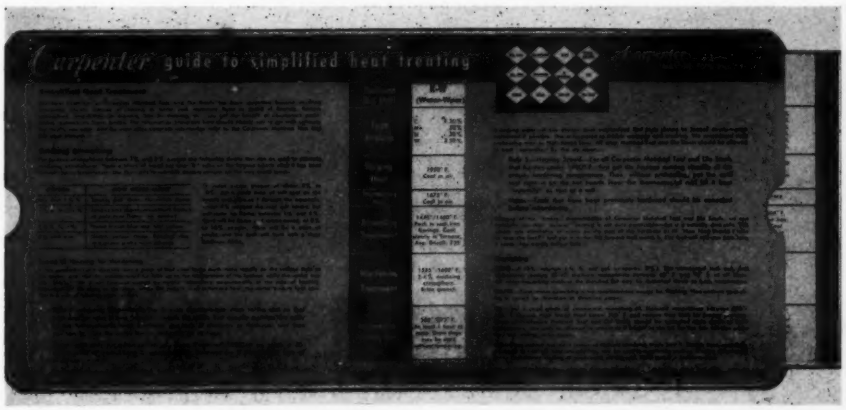
A Tracing Template covering over 300 standard and component jigs and fixtures is available from Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, O. These standard templates will save layout time. Included are templates of jig feet; flanged and t-slot-nuts; cast iron hand knobs; fixture keys; knurled head, quarter turn, and shoulder screws; latch bolts; toggle shoe clamps; and v-pads. **No. C11.**

Simplify Machine Installations on all types of floors and control transmitted vibration and noise with Unisorb. Unisorb pads and cement eliminate the need for lag screws and expansion bolts when anchoring practically any type of machine. A booklet presents photos of actual on-the-job applications of Unisorb. Also discussed are the advantages of using the pads and cement. One section is devoted to the highlights from a study of vibration. The Felters Co., 210 South St., Boston 11, will make available copies of the booklet, "Facts about Anchoring Your Machine with Unisorb," or — **C12.**

How to Clean Sludge Out of Hydraulic and Lubrication Systems without shutting down machines is told in the technical bulletin, "Sunvis 700 Oils." Also pointed out is how continued use of these highly detergent oils keeps equipment as clean as new. Sun Oil Co., Philadelphia 3, will issue copies of Technical Bulletin 44, or — **Circle No. C13.**

Recommended Practice for the Welding of Steel Castings is detailed in a 40-page manual. The first section covers welding methods—preparation, effects, combating the effects of welding, and the welding operation. Electrodes are discussed in the second section. The final part is devoted to recommended welding procedure for 21 carbon-steel and low-alloy steel castings. Direct requests for copies of the manual to Tempil° Corp., 132 W. 22nd St., New York 11, or — **Circle No. C14.**

This Guide to Simplified Heat Treating presents the type analysis, forging and normalizing heats, annealing and hardening treatments, and recommended drawing range for several tool and die steels. Discussed are oxidizing temperatures, speed of heating for hardening, and quenching. On the reverse side are charts showing the effect of drawing temperature on hardness and the approximate time to reach drawing temperature. The Carpenter Steel Co., Reading, Pa., or — **C15.**

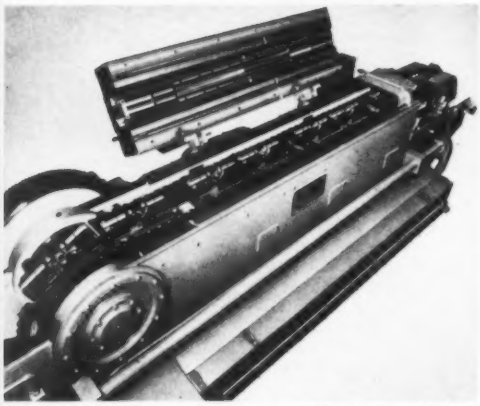


PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

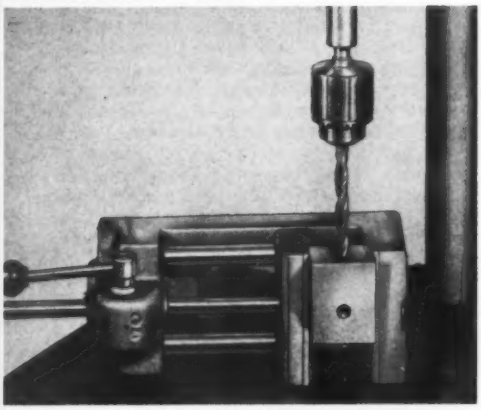
BLAST CLEANER . . .

Reduce operating costs and improve blast cleaning efficiency with a new batch-type airless abrasive blast cleaning machine. The Super Tumblast which has a load capacity of 28 cu ft and throws 830 lbs of abrasive/min, is designed for cleaning sand, scale, oxides, etc. from the work. Wheelabrator Corp., Mishawaka, Ind., or — **Circle No. A1.**



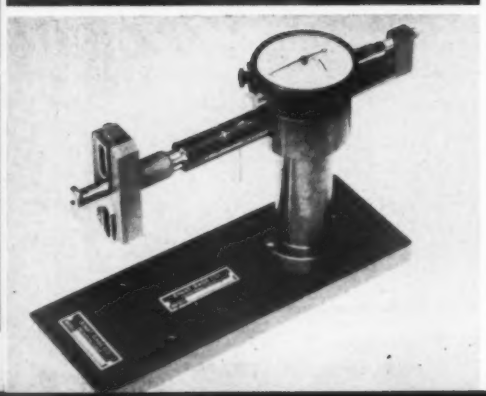
BROACHING . . .

Automatic fixture locking, loading, unloading, and operation are features of this heavy duty horizontal continuous broaching machine announced by Detroit Broach Co., Rochester, Mich. Cutting speeds up to 40 fpm can be obtained from an electric-mechanical drive and others through simple change gears. **Circle No. A2.**



THREE-SIDED VISE . . .

Model "TS" three-sided Grip-Master vise and fixture base features jaw sides that are precision ground at right angles to parallels for accurate machining from top and side without resetting work. It is offered with 3″ or 4″ jaw widths, with "PA" or standard "SV" locking mechanisms. Heinrich Tools, Inc., Racine, Wis., or — **Circle No. A3.**

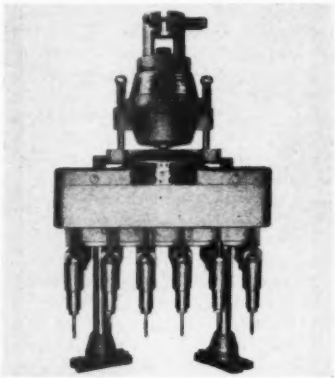


BASIC GAGE . . .

A range from ¼″ to over 5″ is covered by Thousand Series dial bore basic gage. The interchangeable tips are used for checking bores, shallow counterbores, grooves, etc. The gage which provides 0.0001″ dial indicator readings, is furnished as a portable instrument. Rimat Gage Co., 21 W. Dayton St., Pasadena, Calif., or — **Inform-A-Gram No. A4.**

MULTIPLE HEAD . . .

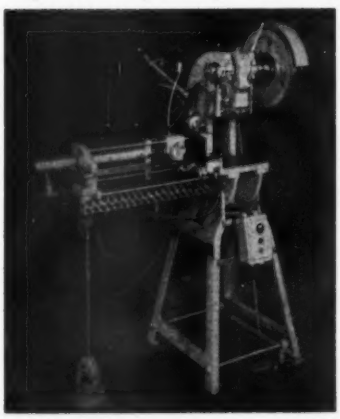
Up to 6 holes can be tapped or drilled in a 3″ x 13-15/16″ rectangular area with the Ettco-Emrick multiple head. Model 1000 will fit any drill press and can be set in a wide variety of



hole patterns. Capacities range up to 5/16″ drills or taps in aluminum. The spindle adjustability is provided by flexible shaft drives. Details are in Bulletin 600A supplied by Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, or — **Circle Inform-A-Gram No. A5.**

SLIDE FEED . . .

Feed lengths adjustable up to a maximum of 12″ can be obtained on this air-operated slide feed shown mounted on a small OBI press. Longer feed lengths are possible by using a counting



device which is extra. Width and thickness capacities are up to 15″ wide x 0.032″ thick, 12″ x 0.062″, and 6″ x 0.125″. U. S. Tool Co., Inc., Ampere (East Orange), N. J., or — **Inform-A-Gram A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

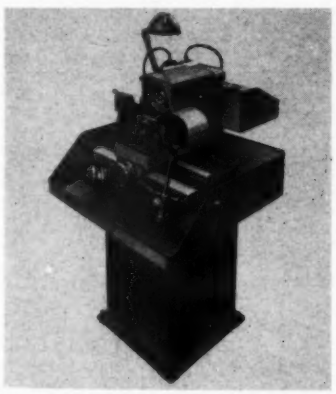
MICRO-HARDNESS TESTER . . .

A load-weight range of from 25 to 1000 grams is a feature of this combination micro-hardness tester and metallurgical microscope. Only one minute is required for a complete test cycle.

With interchangeable vise accessories the instrument can be used for testing small precision ground or lapped parts, small diameter wires, very thin materials, cutting tool edges, etc. The Sheffield Corp., Dayton 1, O., or — **Inform-A-Gram No. A7.**

CHIP BREAKER GRINDER . . .

Recommended for light or intermittent duty grinding is this new Model CM-6W grinder. It is offered as a single end wet chip breaker grinder or as a combination chip breaker and diamond finishing grinder. The



grinder accommodates 6" dia chip breaker wheels and with cup wheel arrangement uses a 6" dia cup wheel. Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich., or — **Inform-A-Gram No. A8.**

DIE HEAD . . .

Cut straight, regular taper, and reverse taper threads with Style DMRT H & G insert chaser die head. It will cut ⅛" to ¾" pipe threads. The die head is designed for use on the No. 2 Brown and Sharpe automatic screw machine. The Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven 6, Conn., or — **A9.**

COIL HANDLER . . .

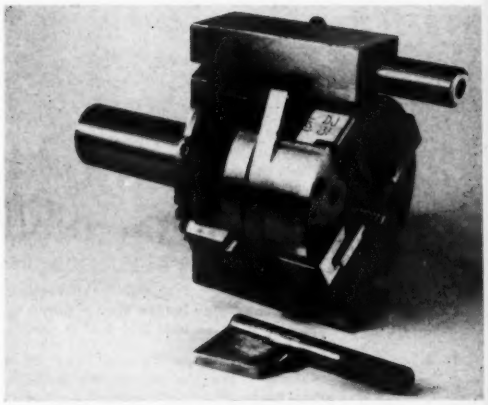
The Twin-In-Action coil handler can be built to meet customer specifications and to handle coil weights up to 40,000 lbs. The power-driven unit built of standard components has 4 expander arms and laterally adjustable reels. It will handle steel or aluminum stock and prepainted stock. Sesco Inc., 8881 Central Ave., Detroit 4, or — **No. A10.**

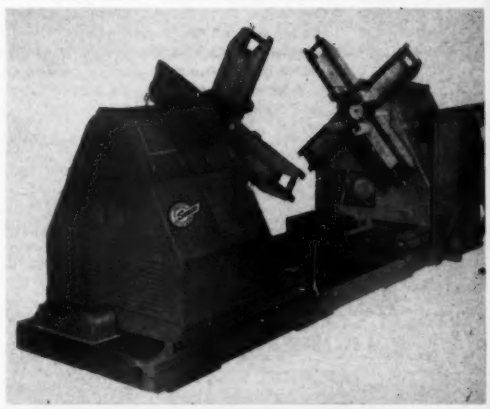
SMALL ABRASIVE WHEELS . . .

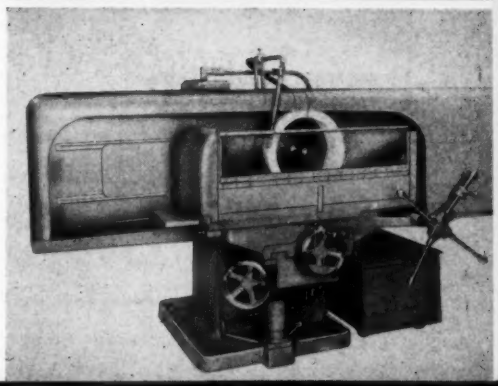
This new line of small "PG" wheels has been designed for polishing metal with portable hand tools. The coated abrasive wheels replace small setup wheels in stainless and sheet steel fabricating, plating, etc. They're also suited for polishing soft metals. Minnesota Mining and Mfg. Co., Dept. F6-99, 900 Fauquier St., St. Paul 6, Minn., or — **A11.**

18" FACE GRINDER . . .

Eliminate pulleys and belts with the 18" face grinder which incorporates a motorized spindle and furnishes an exceptionally powerful drive. The machine is applicable for any flat, square surface grinding job. Abrasive Machine Tool Co., East Providence, R. I., or — **A12.**







"Em-re" Dial Indicator, fully-jeweled, 2¼" diameter, 24 models, 6 ranges — .025" to .250" — with graduations in .00005", .0001", .00025", .0005" and .001".

Em-re

PRECISION

DIAL INDICATORS

THE ONLY 100% SHOCKPROOF DESIGN

Patents Pending.

Not only is this remarkable new indicator the most accurate on the market . . . but also it is the only one that is completely shockproof.

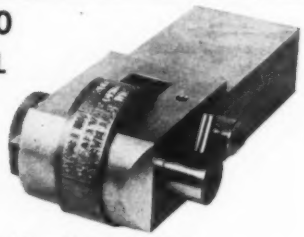
The cutaway shows the exclusive "Em-re" safety device that makes the precise, accurate measuring system 100% shockproof. It is fully protected — at the beginning of the range, throughout the range, at the top end of the range, and on the return stroke. The fully-jeweled and completely shockproof movements of "Em-re" dial indicators give accurate, repeated readings on any application from severe production inspection to careful laboratory measurements.

For complete details send for Bulletin 455-E

PETZ-EMERY INC.
PLEASANT VALLEY, NEW YORK

CIRCLE INFORM-A-GRAM KEY NO. 1381

New Series 1500
ROLL MARKING TOOL
PRECISION BUILT



- Trouble-free operation.
- Master roll die has recess for interchangeable part numbers, trade or code marks.
- Easily attached to automatics, turret lathes, hand screw machines.
- Other models available for special marking applications.

MARKALL offers prompt service on roll, hand and press marking dies, type and type holders, and embossing dies. Precision machine graduating and engraving services also available.

Send for free literature — Inquiries invited.

MARKALL PRODUCTS CO. 27100 Knickerbocker Road Bay Village, Ohio (Cleveland)

CIRCLE INFORM-A-GRAM KEY NO. 1382

HAND KNOBS

6 SIZES
CAST IRON

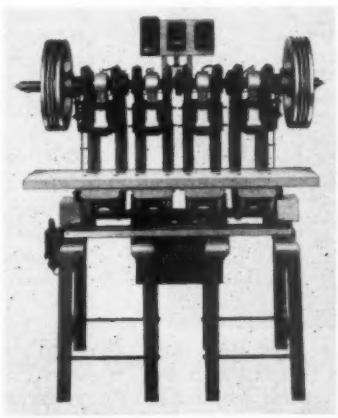
Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

Write for catalog

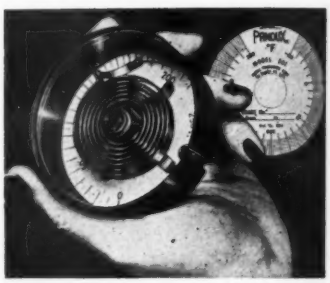
TIETZMANN TOOL CORPORATION
Dept. HK-2 • Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1383

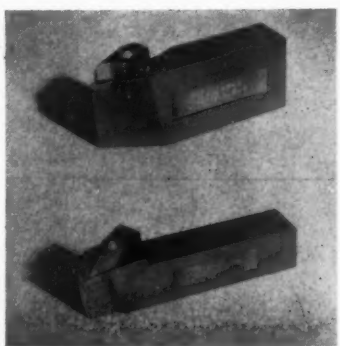
An Adjustable-Clutch Tapping Head provides automatic torque control for drilling, reaming, spot facing, counterboring, and right or left hand tapping. The Tap-Saver which operates automatically after setting the material selector, eliminates tap breakage, improves thread accuracy and finish, and speeds work. It is available in 3 sizes from Davis Boring Tool Div'n, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. **Circle Inform-A-Gram No. A13.**



This Multiple Ram Press provides a large bed area for multiple die operations where only moderate tonnage is required per die stage. Any number of rams can be supplied in tandem, each ram performing one operation in a progressive setup. Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or — **Circle No. A14.**



Measure the Ambient Temperature and record the lowest and highest values over any given period of time with a low-cost recording maximum-minimum thermometer. It features a replaceable paper chart on which a permanent record of the temperature excursion is recorded. The Pandux Thermometer comes in 2 ranges — Model 581-F from −50°F to 250°F and Model 581-C from −50°C to 100°C. Pacific Transducer Corp., 11836 W. Pico Blvd., Los Angeles 64, or — **A15.**



Three New Holders for throw-away inserts have been added to the Multicut line by Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich. Shown is Model MX-8-T5C (top) and one of the right and left hand holders for plunge turning and facing. All use diamond shaped inserts which have 4 sets of cutting edges each. **No. A16.**

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

Model "D"

*A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

CHANDLER TOOL CO. Muncie, Indiana

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COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

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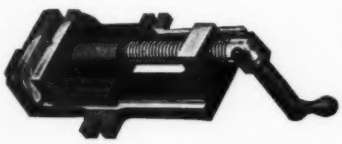

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No.	Jaw Width	Max. Opening
1D	3½"	4 "
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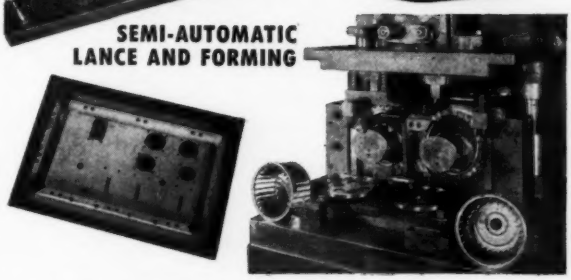

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Direct Factory Representatives located in Principal Industrial Areas

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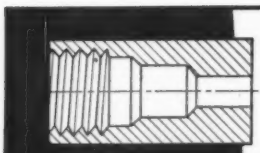

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Production swings up when step drills are used because . . .

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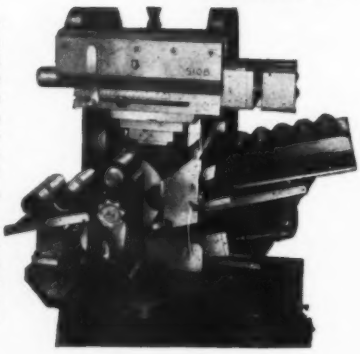
CIRCLE INFORM-A-GRAM KEY NO. 1401

Faster, Better, Less Expensive . . . with job designed MARKING GEO. T. SCHMIDT Production Marking Machines

The fully automatic, hydraulically - operated tube marker shown here was designed by GTS engineers for major automotive manufacturers.

The units roll a trademark and part number on 2500 to 3000 mild steel thin-walled tubes per hour — a speed that cuts cost per impression to the bone. Hydraulic control keeps all impressions clean, accurate, and of precisely the same depth.

Have a GTS Sales Engineer call on you, without obligation, to discuss how modern marking methods can save costs and speed production in your operation.



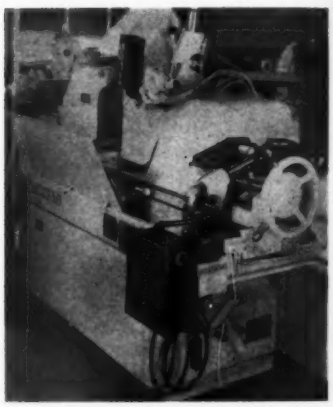
GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

If It's Worth Making, It's Worth Marking

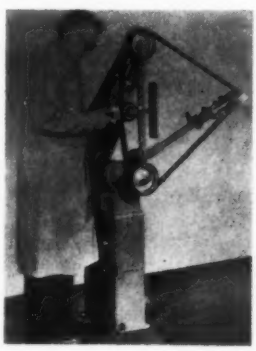
CIRCLE INFORM-A-GRAM KEY NO. 1402

Accurate Measurements for Flatness up to 1 light band (0.0000116) or less are possible with the Mono-Light Unit featuring a helium lamp. The low-cost portable unit has an extra-large opal glass lighting area to provide the widest possible range of use for small and larger piece parts. Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, or — **Circle Inform-A-Gram No. A17.**

Rapidly Produce Micro-Inch Finishes on all types of tungsten carbide and ceramic cutting tools with a new lapping machine. The Carbide Micro-Inch Finisher is equipped with 2 removable rotating Meehanite laps of 6" dia, charged with Di-Met diamond compound. Finishes of ½ to 6 microinches are possible depending upon the grade of compound used. Di-Met Corp., 1873 Mullin St., Torrance, Calif., or — **Circle A18.**



Increase Centerless Grinding Production 200% to 300% with the Feedcision automatic infeed grinding attachment. It is equipped with a variable position positive stop controlled by one simple set screw for stock removal from 0.005 to as much as 0.040 in one pass. Details on the attachment which is easily installed on any centerless grinder are supplied by Modern Devices, Box 429, Libertyville, Ill., or — **Circle Inform-A-Gram No. A19.**



All Basic Types of Belt Operations: contact wheel, platen, slack-of-belt, and formed wheel can be performed by Model DBA-1F Flex-A-Belt machine. The extension arm assembly can be rotated a full 360°. Its versatility can speed up many costly grinding, polishing, or deburring jobs and at the same time cut production costs. Details are in Circular A 1357 from Curtis Machine Corp., Jamestown, N. Y., or — **Circle Inform-A-Gram A20.**

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The oil, heat and wear resistant Neoprene insert, found only in "Tool-flex", provides a universal float that corrects for both parallel and angular misalignment. This assures quick set-ups and minimizes scrap due to bell mouthed and oversized holes or torn and oversized threads. By floating reamers, taps, etc., in a cushion of Neoprene, tool life is increased. Available in a range of sizes and models to suit any requirements, including close centers and Acme threaded shank for multiple spindle set-ups. "Tool-flex" holders are fully guaranteed.

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Manufacturers of Rousselle Presses

Significant savings may result if you let our engineering staff assist you. There is no obligation.

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Rousselle Presses are sold exclusively through leading machinery dealers.

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Choice of 25 models in 5 to 40-ton sizes.

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The Genuine MAUSER **VERNIER CALIPER**

IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT

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• HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
• SPECIALLY LONG VERNIER to read thousandths
• 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back

$14.75 PPD

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Since 1907

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BLADES
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● New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
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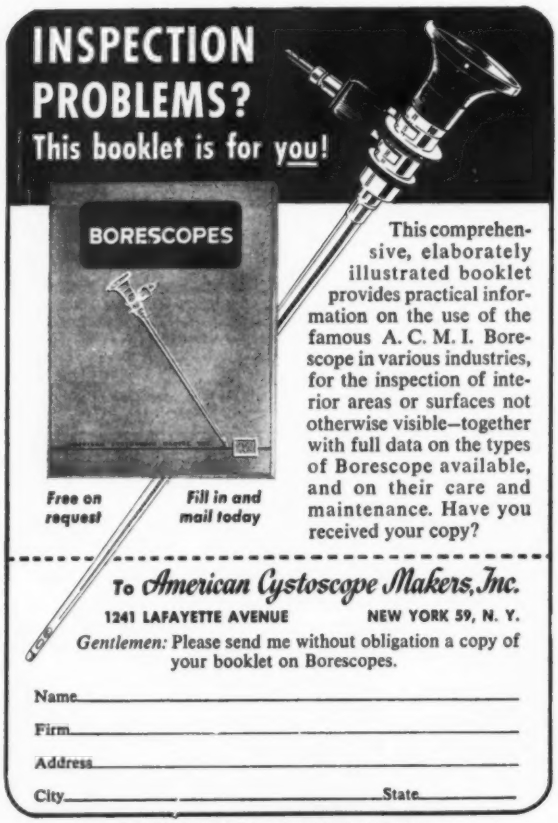
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This comprehensive, elaborately illustrated booklet provides practical information on the use of the famous A. C. M. I. Borescope in various industries, for the inspection of interior areas or surfaces not otherwise visible—together with full data on the types of Borescope available, and on their care and maintenance. Have you received your copy?
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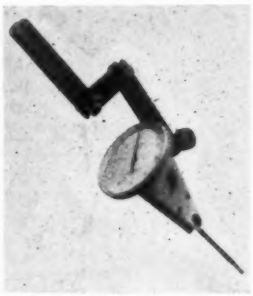
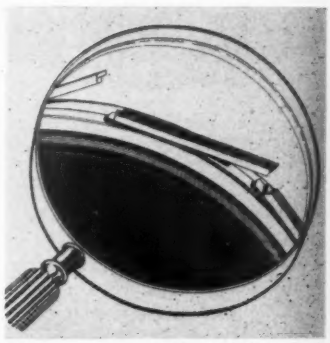
CIRCLE INFORM-A-GRAM KEY NO. 1422

Flatten Mild, Hard - Tempered, and Stainless Steel; aluminum, brass, or copper in widths up to 42" and gauges from 0.020 to 0.093 with Model 11-F Roller-Leveller. The machine is used for straightening sheet stock, coil stock, producing cut length flat sheet from coil, and livening deep drawing steel. It operates at a standard speed of 56 fpm. F. A. Woehr Machine Co., 17 Favor St., Rochester 8, N. Y., or — **Circle Inform-A-Gram No. A21.**



Sensitivity and Repetitive Accuracy are features of the Parvus-Compac Indicator. It has a reversible 0.080" contact point that is adjustable 180°. The contact point is easily changed. Five different models of the Parvus-Compac Indicator are available. Borel and Dunner, 19313 Farmington Rd., Livonia, Mich., or — **Inform-A-Gram A22.**

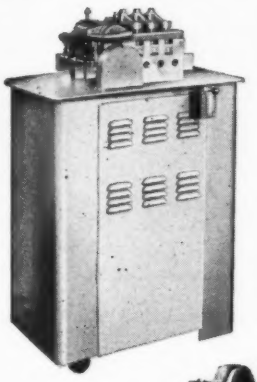


5/16" Wide Flat Bands have been added to the line of replacement file bands produced by Boice-Crane Co., 963 W. Central Ave., Toledo 6, O. The file segments join in such a way as to present a solid file to the work with an angular joint between segments. The availability of file guides and file bands for use on 18" and 24" Grob band saws has also been announced. **Circle No. A23.**

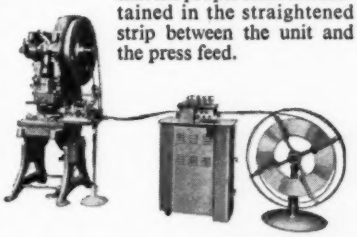
This Lightweight Foot Switch developed by Linemaster Switch Corp., 432 Woodstock Terrace, Woodstock, Conn., is only 3⅝" in dia and 1⅛" high. The compact, rugged switch can be used for many industrial applications. It is furnished with a 6' black rubber cord set. For further details, get a catalog sheet from the company. **No. A24.**

Economy • Dependability

WITTEK
STOCK STRAIGHTENERS



Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

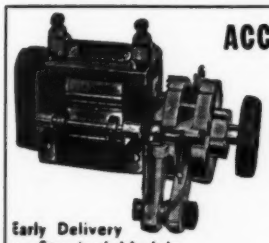
WITTEK Manufacturing Co.

4323 W. 24th Place • Chicago 23, Illinois

5577

Production Feeding Equipment

CIRCLE INFORM-A-GRAM KEY NO. 1431



ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO
12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long dependable service.

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Expanding Mandrels

Accuracy 001" - No Distortion

No Slipping - Everlasting

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1433

Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Major Vulcan Services

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.
741 LORAIN AVE. • DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1434

MADE WITH "MEYCO" CARBIDE KNOW-HOW!

PRECISION CIRCULAR CUTTERS!

MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal. Write for Bulletin No. 51

ESTABLISHED 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1441

FREE... 64 PAGE CATALOG

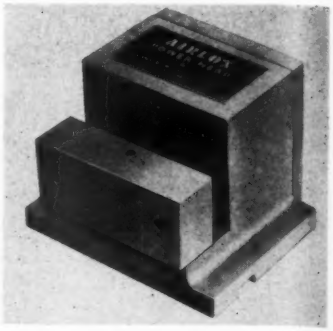
WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

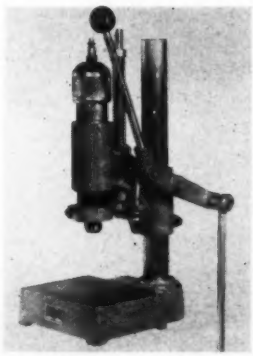
JERGENS TOOL SPECIALTY CO.

Dept. TE-7 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1442

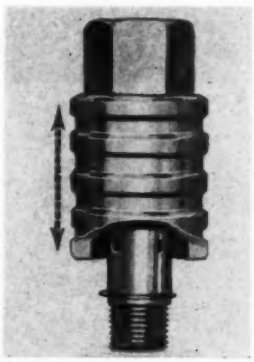


This New Power-Head is used to provide power for fixtures, making air vises, and for welding positioning. It can be used singly or in multiples. The company states that if 1000 lbs push is enough, then Model 400 Airlox Power-Head is the answer. Production Devices Inc., Whitehall, N. Y., or — **Circle No. A25.**



A Series of Blows with a smaller hammer of constant stroke and high repetitive frequency is delivered by the new Model 150-RH repeating air hammer. This impact machine has the same base and frame as Model 150-VS, but differs in hammer mechanism and operation. It is used for riveting, light swaging and upsetting, planishing, and seam-crimping in light sheet metal. Heidrich-Nourse Co., 631 E. 3rd St., Los Angeles 13, or — **A26.**

The 15-Ton Deep-Throat Punch Press introduced by Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, has no clutch and flywheel. It has the same safety and mechanical advantages as the 15-ton Electro-Safe standard model. Versatile controls permit changing from single trip to continuous stroke, inching, or two-hand or foot control by turning a dial. **No. A27.**



A New "In-Line" Sleeve-Type Valve has been designed to control clamp-type and similar single-acting air cylinders. The 3-way sleeve valve is available in ⅛", ¼", and ⅜" NPT sizes. It can be mounted directly in the cylinder port or at any convenient location in the airline. Specifications and prices can be obtained from Modernair Corp., 400 Preda St., San Leandro, Calif., or — **Circle No. A28.**

Fast, Efficient Operations without the use of electronic tubes, rectifiers, or condensers is permitted by a new type of metal disintegrating machine. Model B-1 quickly removes broken taps, drills, etc. It features a self-contained cabinet. Jiffy Disintegrators, Inc., 109 E. Nine Mile Rd., Detroit, or — **Circle Inform-A-Gram No. A29.**

When You Can't Turn the Tap Wrench for Lack of Space....

WALTON TAP EXTENSIONS
QUICKLY PROVIDE NEEDED LENGTH

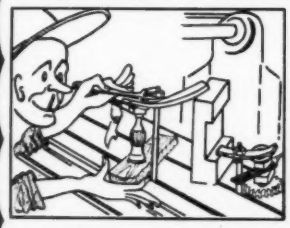
Walton Tap Extensions are a quick solution to this troublesome problem — where it is difficult or impossible, because of limited space, to turn a tap wrench.

Fit all standard hand taps (4-flute, 3-flute, and 2-flute styles) from #10 3/16" to 1" inclusive. They are made of special alloy steel, heat-treated, with square openings cold drawn to conform to size.

Send for descriptive bulletin and price list, No. 38, listing these and other Walton Specialized Tools: Tap Extractors, "Reps" Pipe and Stud Extractors, and "Walton-American" Tool Holders. All tools offered for a 30-day FREE TRIAL.

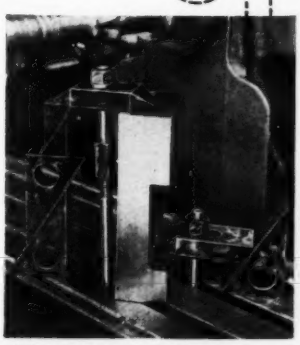
The WALTON Company
HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1451



WHY WASTE YOUR PROFITS ON MAKESHIFT SETUPS?

- **T-NUT & STUD SETS**—*12 SIZES*
- **STEP BLOCK & CLAMP SETS**—*5 SIZES*
- **PUNCH PRESS SETS**—*5 SIZES*



BE WISE *Save with* **NORTHWESTERN**

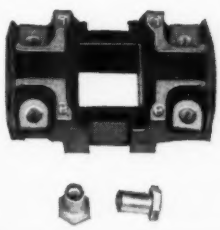
CATALOG No. 23 SENT ON REQUEST

Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1452

THE ANSWER
to some *difficult*
RIVETING PROBLEMS

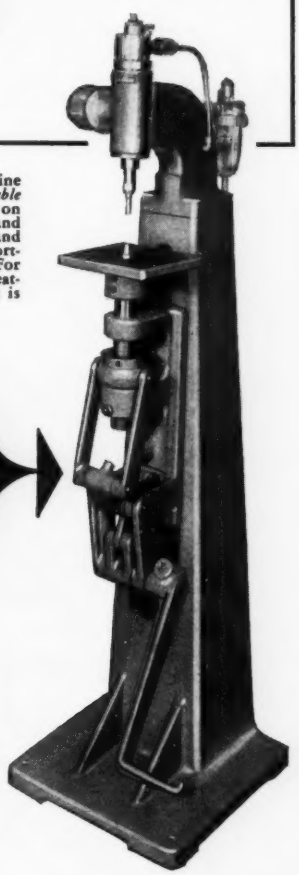
For Example:



The manufacturer of this fragile molded terminal block was unable to rivet the metal inserts until the HILL RIVETER eliminated breakage with a timed cycle of 3 seconds and controlled light blows at 10 psi.

This air-operated riveting machine produces *accurately controllable* results that cannot be obtained on ordinary machines. It is fast and efficient, extremely versatile, and easily adaptable for either short-run or mass-production jobs. For regular solid riveting, it is unbeatable; for difficult problems, it is *The* Answer.

THE HILL PNEUMATIC RIVETING MACHINE



Essentially, the machine consists of a revolving, air operated, reciprocating hammer, working against an anvil which is adjustable in a rigid bracket. Many important details have been worked out for convenience, for neat appearance, for long life, and for superior performance. *For all details, and complete specifications, write for free bulletin: "High Speed Production Riveting."*

HILL MACHINE COMPANY

1301 EDDY AVE., ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1453

For most economical threading on all Automatic Screw Machines, Chucking machines, Bolt threaders, Drill presses, etc.

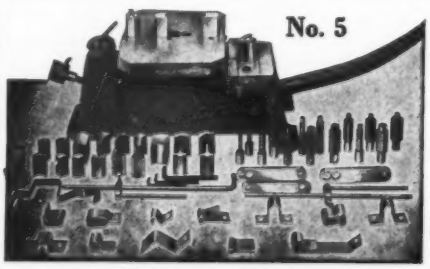
H & G insert chasers

CUT YOUR COSTS AND DOWN TIME

For less than $40 you get 12 sets of ¾-16 (or any stockable size) Insert Chasers; each set ground ready for business. This dozen sets can thread hundreds of thousands of parts with no down time or sharpening time. Can be thrown away when dull or if you prefer, flash grind the dull sets and make an extra profit. Threads stand critical examination and conform to the close tolerances of Class 3 fits. Send for our digest of the Government publication, "UNIFIED AND AMERICAN SCREW THREADS".

THE EASTERN MACHINE SCREW CORPORATION 29-49 Barclay St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1461



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Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

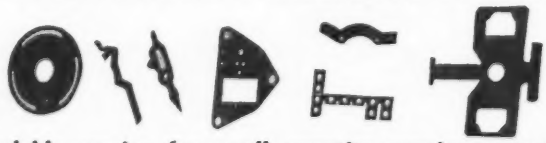
Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

ALSO AIR OPERATED MODELS.

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1462

STAMPINGS - - - SHORT RUNS



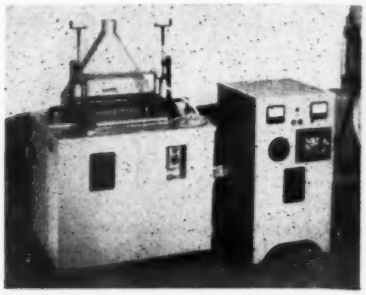
A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

Linden 8-3700 "Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1463

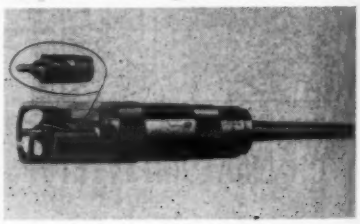
Plate Large Size Metal Forming and Plastic Molding Dies as well as engraving plates, heavy shafts, etc. with a new, large capacity chrome-plating unit. Chromplater Model 300 has a plating tank 15" x 20", x 30" deep. It features a Plastisol



covered steel work platform with bus bar supports and acme thread height adjustment for maximum plating efficiency. Dawson Corp., 302 Fifth Ave., N. Pelham, N. Y., or **Circle Inform-A-Gram No. A30.**

An Adjustable Magnetic Workholder has been designed for use on any machine equipped with a magnetic chuck. It is constructed of alternating laminations of brass and iron, possessing high permeability and low residual magnetism, which are held without pins or rivets, match perfectly, and cannot shift. The holding block has a flat ground face which is rotated by hand to the required angle. Anton Machine Works, 1226 Flushing Ave., Brooklyn 37, or **Circle Inform-A-Gram No. A31.**

A Micrometer-Stop Driver has been redesigned to take stub taper tools which are used on the center holes of all kinds of shafts. It is an adaptation of Cogsdill's Micro-Limit

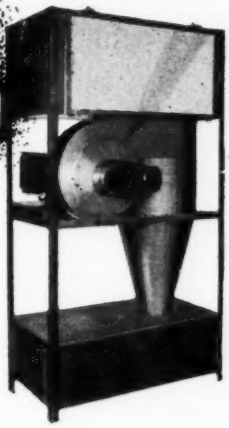


anti-friction bearing driver. The driver is available with straight or taper shank and can be used in drill presses, lathes, or hand drills. Cogsdill Twist Drill Co., Detroit 21, or — **Circle Inform-A-Gram No. A32.**

Fast, Easy, Direct Readings in Rockwell or Brinell Scales are obtained with a portable metal hardness tester offered by Newage International, Inc., 222 York Rd., Jenkintown, Pa. A direct reading can be made by placing the tester on any size, shape or type of metal, pressing the handgrips down, and reading the dial. The unit eliminates the need for conversion charts or calculations. **Circle No. A33.**

EFFICIENT–LOW COST

Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM
• READY TO USE

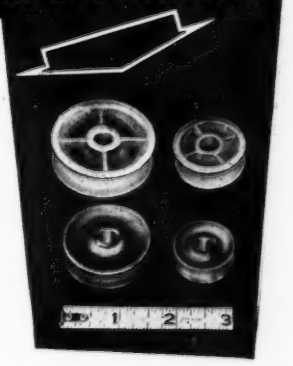
Also a Complete Line of Mist Collectors

AGET MANUFACTURING COMPANY
1394 E. CHURCH ST. • ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1471

CASE HISTORY OF A SHORT-RUN PLASTIC

Nylon Pulley Saves Sailboat Manufacturer MONEY, WEAR and WEIGHT



Converting from a metal machined casting to a Nylon pulley enabled a maker of sailboats to eliminate scratching and nicking of the canvas top and lacquered wood surfaces of his boats. The self-lubricating Nylon pulley eliminated the oilite bearing-type metal pulley and saved overall pulley weight as well. Cost-wise, the customer can now buy, in thousand lots, two different size pulleys, molds included, for less than 1,000 each of the old metal pulley. Additional orders will be even less.

Plastic parts can save dollars and improve product usage. **Consider** *short-run molded plastics for your product. Send a* **blueprint** *or sample for prompt quotation.*

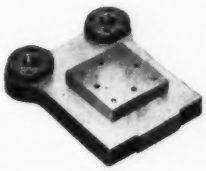
DAYTON ROGERS *Manufacturing Company*

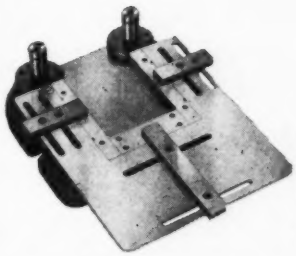
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1472

Punches and Dies

Notching Die with Gauge Table





Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

Immediate Delivery

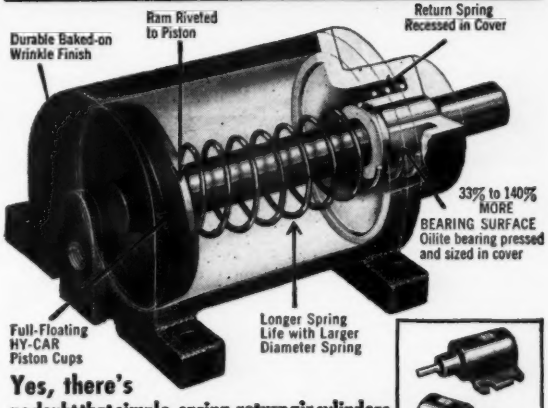
What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

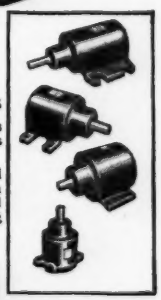
Send for free illustrated catalog No. 154 AF. Net prices shown.

WARD Machinery Co. 564 West Washington Chicago 6

CIRCLE INFORM-A-GRAM KEY NO. 1473

SINGLE-ACTING CYLINDERS *COST LESS: to buy, to use!*


Durable Baked-on Wrinkle Finish
Ram Riveted to Piston
Return Spring Recessed in Cover
33% to 140% MORE BEARING SURFACE Oilite bearing pressed and sized in cover
Full-Floating HY-CAR Piston Cups
Longer Spring Life with Larger Diameter Spring



Yes, there's no doubt that simple, spring-return air cylinders are cheaper to start with, and use only half as much air as double-acting cylinders. The valves and hookups are simpler and cheaper, too.

What's more, MEAD distributors carry local stocks for *immediate* delivery in six bores from 1" to 6", six stroke lengths from ½" to 3", and three mountings. Write now for single-acting cylinder catalog 5A-76

MEAD

SPECIALTIES CO., 4114 N. Knox, Dept. HA-76, Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1474

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

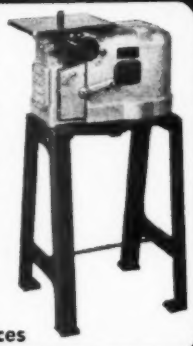
DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.



Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1481

STEP RIGHT UP FOLKS FOR A FREE HELPING OF STINGING CHIPS ···
GET 'EM WHILE THEY'RE GOOD 'N' HOT!!
ENOUGH OF THAT! THE BOSS WANTS YOU TO USE THIS DILLEY MAGNETIC GRIP SHIELD!!
HERE! SLAP IT ONTO YOUR MACHINE AND YOU'LL SAVE EVERYBODY FROM CUTS AND BURNS!
?
NEXT DAY···
JOE'S PRODUCTION HAS DOUBLED AN' EVERYBODY'S SAFE AN' HAPPY!!
FINE! I WANT "DILLEYS" ON EVERY MACHINE IN THE PLACE!

Why don't *You* get HAPPY?

Write us today for descriptive folder with prices.

The Dilley Mfg. Co., 1633 Ansel Rd., Cleveland 6, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1482

MICRO-MINIATURES...

Small
END MILLS AND ROUTER BITS

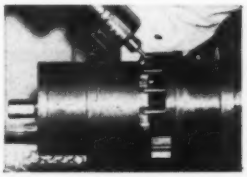
Ground from SOLID. Made to do a NEW job of milling and routing at high speed and fast feed on production runs as well as in the tool room.

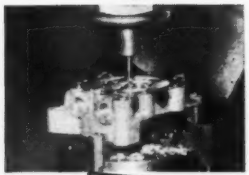
THE SECRET

of their durability and long life lies in our method of grinding which produces a smooth, unbroken cutting edge. No saw-tooth edge to load-up and break-down.

MICRO MINIATURES ®

See the display of Micro-Miniatures at your jobbers or write us for details.





DISTRIBUTORS *in principal cities*

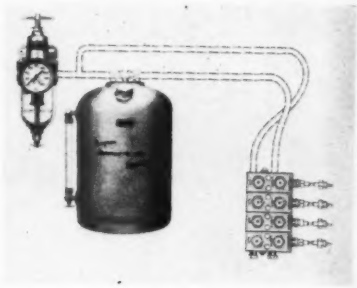
When you think of small END MILLS — think of MICRO MINIATURES

Write for Catalog

WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif

CIRCLE INFORM-A-GRAM KEY NO. 1483

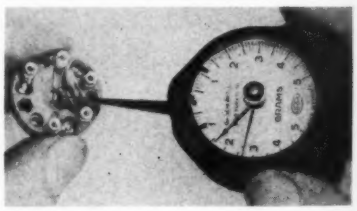
A More Uniform and High Quality Spray of Cutting Oil is applied directly on the close interfaces between the tool and workpiece by this Spray-Lube system. With this



system, the flow of air and cutting oil is more accurately controlled. For most operations, a spray uses only 4 to 12 fluid oz of cutting oil/hr. C. A. Norgren Co., 3499 S. Elati St., Englewood, Colo., or — **No. A34.**

Convert Any Standard Lathe into a high-speed, semi-automatic production tool with a precision boring, turning, and facing attachment. The Exactomatic tool holder is equipped with both pneumatic and hydraulic action. Micrometer adjustment of the tool carriage permits tolerances of 0.0002" or less and holds taper to 0. The attachment can be mounted on a milling machine for semi-automatic milling and slotting. Exact Level & Tool Mfg. Co., Inc., High Bridge, N. J., or — **Circle Inform-A-Gram No. A35.**

Determine the Force needed to actuate delicate mechanisms with a precision dynamometer also known as a gram or spring tension gage. It measures minute pressures, having a range of 0.5 to 5 grams.



The gage will also check predetermined measuring pressures. George Scherr Co., Inc., 200 Lafayette St., New York 12, will supply a pamphlet with information on the gages, or — **Circle Inform-A-Gram No. A36.**

Boremaster Plain Ring Gages are now available in cabinet sets. Three standard sets are offered in ranges from ½" through 3" and sets in other ranges can be ordered. All gages are graduated in increments of 1/64". The cabinet interior is plainly marked with gage sizes to facilitate quick, accurate replacement. Size Control Co., 2500 W. Washington Blvd., Chicago 12, or — **Circle Inform-A-Gram No. A37.**

BRYANT TRUE GRANITE SURFACE PLATES

ROCK OF AGES

Unequalled Wear Resistance!

All Bryant Surface Plates are manufactured from fine-grained *true quartz* granite. Their resistance to wear surpasses *all* other materials used as surface plates.

Patented "head of the grain" finishing process gives added assurance of retained accuracy through years of use.

Full range of sizes available from the same selected black-and-white true granite, in precision, standard and layout accuracies.

Convenient stands feature both utility and appearance.

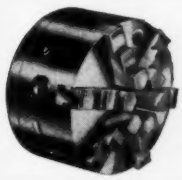
Write for quotation, stating size and accuracy desired

BRYANT GAGE & SPINDLE DIVISION
Box 620-H, Springfield, Vermont

Granite Surface Plates • Groove Gages • Internal & External Thread Gages
Magnetic Drum Memory Devices for Computing Systems
DIVISION OF BRYANT CHUCKING GRINDER COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 1491

compare HORTON Tru-Set FEATURES



- Repetitive accuracy to .0002" T.I.R. guaranteed
- Rugged Meehanite bodies guaranteed for life
- Instant peripheral location – 3 operating pinions
- Available up to 12" in both 3 and 6 jaw styles
- Packed in reuseable airtight metal containers

compare HORTON Tru-Set PRICES

SIZE	MODEL	NET PRICE
5	5T6	86.35
6	6T6	120.65
8	8T6	167.65
10	10T6	247.65
12	12T6	298.45

Chucks listed above are 6 jaw universal type with two sets of jaws. See your Horton Distributor or write direct for new Net Price Selector

HORTON CHUCK

HORTON CHUCK
WINDSOR LOCKS, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1493

NUMBERALL

CUTS THE COST OF STAMPING NUMBERS

NEW MODEL 70

MULTI-WHEEL NUMBERING MACHINE

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL Machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

Hand Shank

Press shank for foot or power presses

Write for Bulletin TP-70

Can be furnished in 1/32" to 3/8" high figures, sharp face gothic or shaded roman style. Automatic - Numbering Heads also can be supplied.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1492

Check FIRST with CHALLENGE ® WHEN YOU NEED

PRECISION SURFACES FOR LAYOUT, INSPECTION & ASSEMBLY

- ☐ Semi-Steel Layout Surface Plates
- ☐ Black Granite Layout Surface Plates
- ☐ Reading Tables
- ☐ Checking Tables
- ☐ Adjustable Floor Plates
- ☐ Bench Plates
- ☐ Lapping Plates
- ☐ Bench Blocks
- ☐ Straight Edges
- ☐ Surface Plates
- ☐ Surface Plate Stands
- ☐ Universal Right Angle Irons
- ☐ Angle Plates
- ☐ Universal Box Angles
- ☐ Box Parallels
- ☐ V-Blocks
- ☐ Cast-Iron Work Benches

THIS CATALOG .... shows the complete Challenge line of Precision Surfaces—all types, all sizes. See it before you buy any surface equipment.

SE-101

Challenge TRADE-MARK ®

TP-7

THE CHALLENGE MACHINERY COMPANY
GRAND HAVEN, MICHIGAN

Send complete Challenge Precision Equipment catalog. Include information on the items checked above.

Name_____ Title_____

Company_____

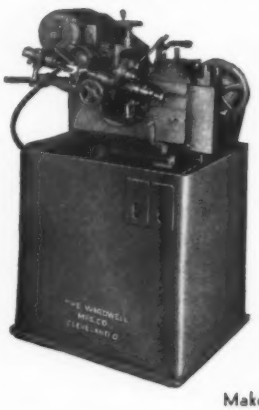
Address_____

CIRCLE INFORM-A-GRAM KEY NO. 1494

Wardwell "50 F" Automatic Universal

Flute Grinder Sharpens

at very lowest cost



It sharpens and keeps in top condition Taps, Saws, Reamers, Woodruff Key Cutters, Milling Cutters. Saves and makes money for you every day. Grinds straight flutes, spiral points, and sharpens saws in gang.
Takes saws from ½" to 8" diameter, in gangs up to 3¾" long — automatically indexes. Takes reamers down to 1/16" diameter.
No special skill needed. Wardwell 50 F starts making money for you the very first day.
Please write for descriptive literature.

WARDWELL MANUFACTURING CO.
3809 Ridge Rd., CLEVELAND 9, O.

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1501

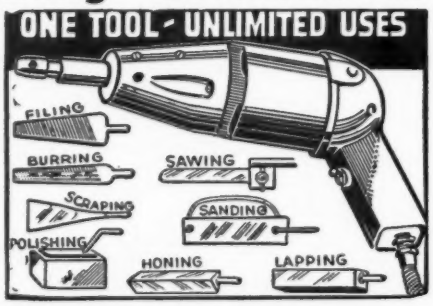
B-R-E-A-K...
Hand Finishing Bottlenecks

WITH

PORTABLE • ELECTRIC
RECIPROCATING TOOLS

These handy tools will cut out many tedious hand filing and finishing operations — Increase Production — Produce Uniform Work.

Light in weight — Delivers 1/8" or 3/8" fixed stroke at 1000 strokes per minute — Operates on 110 volts AC or DC.



ACME TOOL COMPANY
73 WEST BROADWAY NEW YORK 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1502

DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 1503

Monarch Precision SHAPLANE Radius Tools
Illustration shows convex cutter for ¼" to 2½" balls.

FIVE MODELS for LATHES, SHAPERS, PLANERS, BORING MILLS

Range ½" to 3" for concave Radii. Also heavy duty models for radii to 6" on planers, etc.

PATENT PENDING

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C. B. TEETER, TOOL ROOM SPECIALTIES
4470 Oakenwald Ave., Chicago 15, Ill.

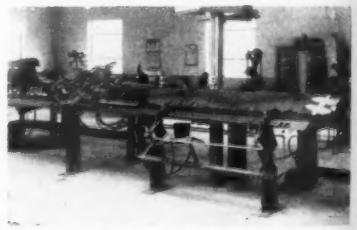
CIRCLE INFORM-A-GRAM KEY NO. 1504

Desired Spindle Speeds can be achieved instantly by a touch of a button on the new Model DSM59 second operation machine. Spindle speed changes for rates between 230 and 3500 rpm can be made without stopping the machine. With this machine, it is possible to chuck par-

tially finished parts and rapidly do close tolerance turning, forming, boring, drilling, threading, and facing with low cost tooling. For complete information, get the DSM59 Bulletin from Hardinge Brothers, Inc., Elmira, N. Y., or —
Circle Inform-A-Gram No. A38.

A New Series of Firlomet cemented carbide blanks has been added to the line of laboratory grade carbides produced by Firth-Loach Metals, Inc., Buttermilk Hollow Rd., McKeesport, Pa. These include standard and rectangular reamer blanks, both in 11 sizes and 2 grades; and solid square tool blanks. More information on the blanks is found in Catalog 2 available from the company, or —
Circle Inform-A-Gram No. A39.

Speed Up Blanking, Shearing, and Secondary Operations with an automatic feeder. The feeder is operated entirely on a small amount of compressed air. It can be designed to operate with any press or



shear and no alteration to either press or shear is needed. Pollasky Engineering Co., 3802 N. 38th St., Milwaukee 16, or —
Circle Inform-A-Gram No. A40.

Accuracy Is Combined with Durability in an inexpensive plain angle wheel dresser. The Angle Master wheel dresser has a Meehanite base which permits drilling and tapping of holes when needed for quick setups on cylindrical grinders. The Angle Master dresses with the diamond point horizontal to the center of the spindle. J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N. J., or—**Circle Inform-A-Gram No. A41.**

Ross STANDARDIZED PUNCHES

YOURS AT 1/3 THE COST!

HERE IS A *STANDARDIZED*, CENTERLESS GROUND PERFORATING PUNCH THAT SPELLS **IMMEDIATE SAVINGS!**

Here's how!

ACCURACY!
QUALITY!
ECONOMY!
DELIVERY!

Centerless ground to within ± .0002" in diameter!

A special high carbon steel insures tough, lasting durability!

Standardization means smooth, high speed turn-out . . . at ⅓ of your own production costs!

Large stock of standard sizes means shipment the *same day* that your order is received!

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ROSS EQUIPMENT CO., INC.

80 College Ave. Rochester 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1511

Since 1903

black devil

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Ever since 1903, when Celfor pioneered in the forging and hot-twisting of high speed drills, "Celfor" tools have been specified by the nation's leading steel fabricators for the drilling and reaming of the really rugged jobs in the toughest alloy steels.

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DIVISION OF AVILDSEN TOOLS & MACHINES, INC.

MAKERS OF "REPUBLIC," "CENTURY," "CELFOR" AND "U. S. EAGLE" BRAND TOOLS

3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES

CHICAGO PLANT
322 SOUTH GREEN ST., CHICAGO 7, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1512

Tomco

HAND WHEELS
HAND KNOBS
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BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

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Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 1513

best for your jobs!

easiest to get!

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LIVE CENTERS

Guaranteed to match the accuracy of your lathes

IDEAL'S simplified ordering plan ends tool room headaches. Get exactly the live center you need when you need it — right from distributor stocks. Widest range of models, sizes and capacities — all precision-built for continuous close tolerances.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

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Please send us data on IDEAL'S complete line of LIVE CENTERS.

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Company_____

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City_____ Zone____ State_____

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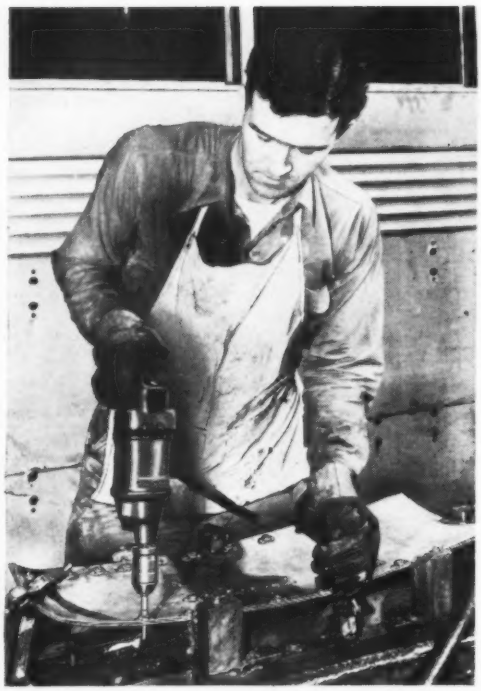

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use ANCHOR® BUSHING DRILL TEMPLATES

Tooling costs were lowered on school buses through use of inexpensive, lightweight ANCHOR BUSHING drill templates at Superior Coach Corporation, Lima, Ohio.

Photo shows typical application on bus assembly line . . . an ANCHOR BUSHING drill template properly supports the drill to accurately locate and drill rivet holes in a contoured reinforcement cap. The same tooling also locates and drills matching hole patterns on the bus body.

Standard ANCHOR BUSHINGS, in drill ranges of #55 - 7/16", are quickly riveted or spotwelded to .050 sheet metal which can be formed or contoured to any desired shape. Other type ANCHOR BUSHINGS are extensively used in laminate plastic tooling.

STANDARD TYPE FOR SHEET METAL TEMPLATES

CIRCLE TYPE FOR LAMINATE PLASTIC TEMPLATES

U.S. PATENT 2483686 • FOREIGN PATENTS PENDING • TRADEMARK REGISTERED

Ask for free ANCHOR BUSHING Catalog . . . it shows how to make inexpensive sheet metal and laminate plastic drill tooling.

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CIRCLE INFORM-A-GRAM KEY NO. 1521

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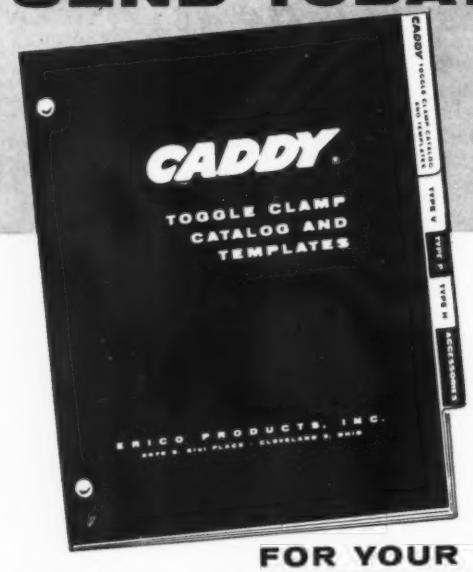

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CIRCLE INFORM-A-GRAM KEY NO. 1522

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. . . tells how diamond abrasive assures better metallographic specimens.

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. . . for dependable metallographic specimens, faster

Precision graded Elgin Diamond assures a consistent surface for examination and saves time in polishing metallographic specimens. Precision graded diamond particles cut clean, eliminate "smearing", preserve grain boundaries. Count on Elgin Diamond for uniform polishing results in all diamond abrasive applications . . . it's the standard for industrial diamond abrasive quality. Write today for this booklet on "Metallographic Polishing With Diamond."

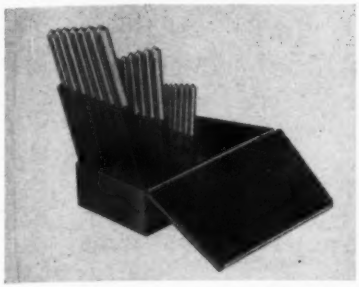
ABRASIVES DIVISION, DEPT. D

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1523

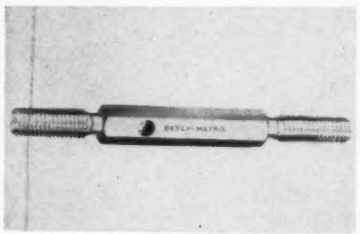
A Complete Line of Drill Blanks for sizing holes has been announced by Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. The blanks can also be used for punches, knock-out pins, gages, dowels, rollers, etc. as well as for stock for arbors, mandrels, router bits, and end



mills. They are the same length as jobbers' drills, hardened and ground to a tolerance of ±0.0003" and can be had in a complete range of fractional, letter, and wire gauge sizes. **Circle Inform-A-Gram No. A42.**

A Conversion Coating for aluminum and zinc designed to meet Specification MIL C-5541 has been introduced by Oakite Products, Inc., 157 Rector St., New York 6. Chromi-Coat prevents corrosion and improves paint adherence. It will also reduce paint chipping and flaking. **Circle Inform-A-Gram No. A43.**

Indicate Extreme Accuracy in Ring Gages with a truncated setting plug gage. Truncated type "go" and "no go" threaded members establish the correctness of new ring gages and the presence of wear in used thread rings. Truncations extend one-half the length on the major diameter of both members.



Sizes range from No. 0 to 1½". Complete information is contained in Catalog 875G available from Besly-Metro Div'n, Besly-Welles Corp., Dept. TSP, South Beloit, Ill., or—**Circle Inform-A-Gram No. A44.**

Exact Measurements of angles of work in progress on grinders, drill presses, shapers, millers, etc. are given by a combination level and angle finder. It is used for setup work or inspection. The pocket-size angle finder is shock and dust-proof and anti-magnetic. Jiffy Tool Supply Co., 109 E. Nine Mile Rd., Ferndale 20, Mich., or — **Circle Inform-A-Gram No. A45.**

FREE DEMONSTRATION

Shows How to Cut Costs with Setko Hopper-Fed* Headless Set Screws!

How Rogan Bros. Uses Setko Method of Hopper-Feeding Set Screws in its Automation of Drilling, Tapping and Inserting

Here is a typical Setko Hopper-Feeding Set Screw installation, showing its use with special equipment designed and employed by Rogan Bros., Skokie, Ill., to drill and tap plastic knobs and insert set screws automatically in sequence. With this Setko method only one machine is required in place of three — and half the number of operators! This is one of many Setko Hopper-Feeding applications. *Mail coupon for Demonstration Details.*

This is the Setko Hopper-Feeding Special Mechanism

*Pat. No. 2,638, 945 Other Patents Pending

Set Screw & Mfg. Co.

158 Main St., Bartlett, Ill. (Chicago Suburb)

We Specialize in Solving Puzzling Set Screw Problems

COUPON

Set Screw & Mfg. Co. 158 Main St., Bartlett, Ill. (Chicago Suburb)

Without any cost or obligation on my part, please send me full particulars about the new Setko Hopper-Fed Headless Set Screws. (Check next line if you would like a demonstration.)

☐ I would like to have a demonstration of the special operating mechanism at your plant in Bartlett, Illinois (Chicago suburb). Please advise me how this can be arranged.

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ADDRESS.....

CITY..... COMPANY.....

ZONE...STATE.....

CIRCLE INFORM-A-GRAM KEY NO. 1531

..THE Precision BENCH TYPE PROTRACTOR

FASTER THAN ANY OTHER KNOWN METHOD

Will check cutting angles, side and front rakes and clearance angles ALL IN ONE INSTRUMENT. Only 4 moving parts in the complete machine. Surfaces subject to wear are carbide tipped.

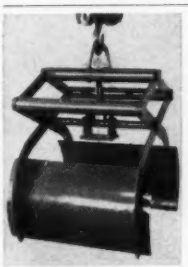
Many of the leading and most progressive plants are now using this instrument with great satisfaction.

Write for descriptive literature and ask about our 10 DAY ON-THE-JOB Trial.

K-P NATIONAL SALES

5280 Grand Haven Rd., Muskegon, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1532



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for FAST · SAFE · BETTER Material Handling of

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400 MODELS

Prompt Delivery
Write for full particulars

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DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1534

Keep Inspectors from Growing Gray!

Put this precision turret lathe to work on your small, exacting jobs and you'll solve many of your production problems. You'll find that even the tough tolerances can be held without sacrificing output. Extremely versatile, easily handled, quickly tooled for a wide variety of work. *Send now for complete information.*

SOUTH BEND 10" PRECISION TURRET LATHE

SPECIFICATIONS:
Swing 10½" • Collet capacity 1" • Spindle bore 1⅜" • Turret slide travel 4" • Spindle to turret 19⅜" max. • Spindle speeds 12 or 24 • Turning, facing, threading feeds for carriage 70 each. Base price $1,601.

SOUTH BEND LATHE
South Bend 22, Indiana

Builders of lathes, milling machines, shapers, drill presses and pedestal grinders.

CIRCLE INFORM-A-GRAM KEY NO. 1541

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request
A few desirable distributor territories still available.

WALLS SALES CORPORATION
333 Nassau Avenue Brooklyn 22, N. Y.

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Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES
Read by Sight, Sound or Feel.

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

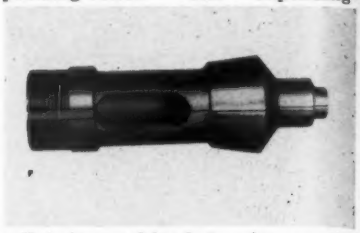
in inch grams...inch ounces...inch pounds ...foot pounds (All sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

P A STURTEVANT CO
ADDISON (QUALITY) ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1543

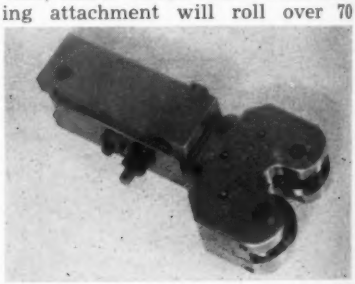
This Expanding-Collet will grip in a hole as small as ⅛". Since it is a one-piece mandrel which acts as a reversed collet, it grips the workpiece on the inside surface. A machine can be converted to internal chucking by inserting the expanding-collet. The expanding-



collet is machined to size on the customer's equipment for greatest possible accuracy. Erickson Tool Co., E. 23rd and Hamilton Ave., Cleveland 14, or —
Circle Inform-A-Gram No. A46.

Rapid, Thorough Cleaning of fabricated parts in preparation for finishing or assembly is performed by the first of a new series of ultrasonic degreasers. The unit which can handle workpieces 8" x 8" x 10", features 2 cleaning stages — vapor degreasing and ultrasonic solvent cleaning. Industrial and Scientific Products Div'n, Curtiss-Wright Corp., Caldwell, N. J., or —
Circle Inform-A-Gram No. A47.

Roll Form a wide range of threads and oil grooves with 3 universal thread rolling attachments announced by Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich. Model BB thread rolling attachment will roll over 70



different threads from ¼" to 1" dia; Model CB, 63 threads with diameters from 6/32" to ⅝"; and Model DB, 53 threads, ⅞" to 1¼" dia in increments of 1/16". They are designed for installation on all types of automatic screw machines.
Circle Inform-A-Gram No. A48.

Unlimited Weight, Length, and Diameter Capacity in a minimum floor space is permitted by the Mogul balancing machine. The pedestal type design allows the units to be placed together or separated according to the length of the piece to be balanced. The drive unit can be positioned at either end or in the center, as individual requirements indicate. Raydyne Corp., 920 W. Laurel St., Springfield, Ill., or —
Circle Inform-A-Gram No. A49.

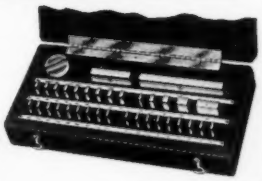
ULTRA-CHEX GAGE BLOCKS

for Every Need!

Supplied in one Superior Accuracy

5 MILLIONTHS ± ACCURACY

82 Block Set
$303.00 Complete
This Set will supply the needs of any discriminating shop that must work to gage-block precision.



34 Block Set $132.50
WITHOUT OPTICAL PARALLEL

9 Block Set
$24.75
OPTICAL PARALLEL **$6.00**

QUICK DELIVERY ON ALL SETS

All Sets at "Money Saving Prices" due to Mass Production Methods.

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GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 -T LAFAYETTE STREET • NEW YORK 12, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1551

STRAIGHTEN COIL STOCK
from ½" to 8" wide...
from .018" to .065" thick...
on a LITTELL "308"*

10-DAY DELIVERY COAST TO COAST

*Heavier Duty straighteners also in stock for quick delivery.

Littell "308" Variable Speed Straighteners flatten coil stock...synchronize feeding of stock with speeds of automatic presses . . . simplify hand feeding. The "308" has brought new speed, efficiency and economy into stamping, blanking and shearing operations from coast to coast. Get full details on these portable straighteners.

Write for Catalog Section 3H

F. J. LITTELL MACHINE CO.
Speed with Safety

ROLL FEEDS • COIL CRADLES
STRAIGHTENING MACHINES
REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland

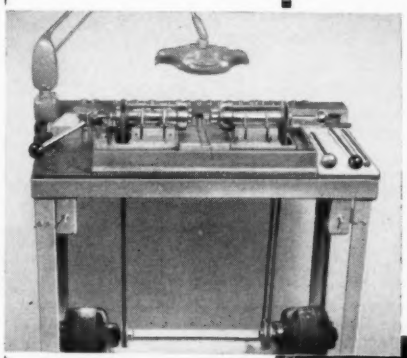
4197 N. Ravenswood Ave. • Chicago 13, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1552

NOW POSSIBLE!

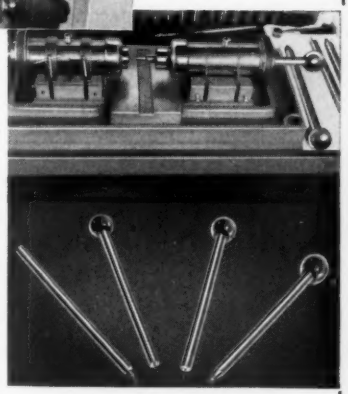
CONSECUTIVE OPERATIONS WITH MULTIPLE TOOLING -

Without removing workpiece from work spindle



JEDCO MICRO-DRILLING MACHINE

★



For Drilling Holes Parallel To A Cylindrical Axis

At last . . . a micro drilling machine with MULTIPLE TOOL QUILLS . . . allowing a series of operations — drilling, chamfering, reaming, etc. — to be done consecutively without need of removing workpiece from work spindle.

OR . . . with suitable attachments, another model can be used to drill holes on rectangular coordinates to an accuracy of plus or minus .0005.

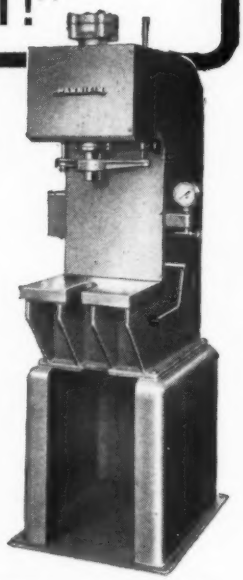
CONTACT US FOR YOUR PROBLEMS . . .

In small tools, minute drilling operations, Micro Drill Guides, automation engineering and building facilities.

MICRO DRILL GUIDE DIVISION JEDCO
3980 SUPERIOR AVENUE CINCINNATI 34, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1553

"BEST $1306 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

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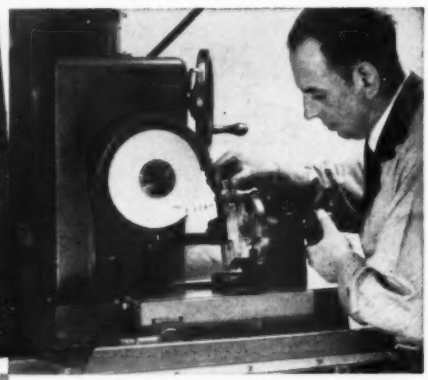
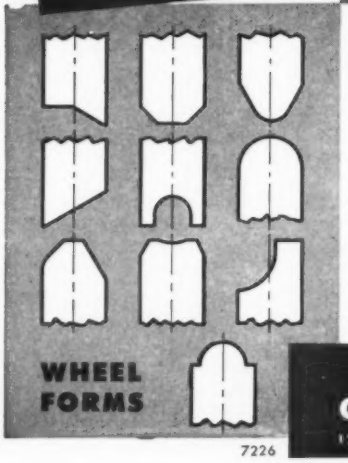
Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME





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The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

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PERFEX GAGE & TOOL CO.

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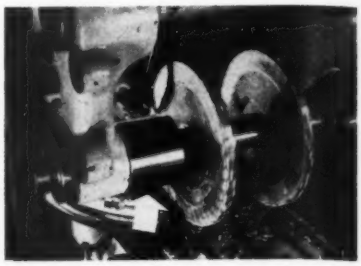

the outer support. New taper sizes, lengths, and arbor and body diameters to fit both extended and built-in applications of Cincinnati, Milwaukee, Sundstrand, and Brown & Sharpe horizontal milling machines are now available.

Circle Inform-A-Gram No. A50.

THE INFORM-A-GRAM CARD IS ON PAGE 84.1

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and

Large Precision Machining

Done to your specifications

We Have

21 Jig Borers

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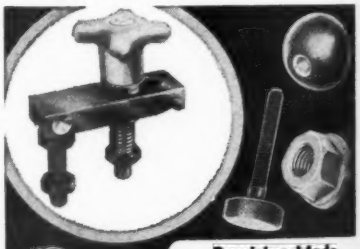

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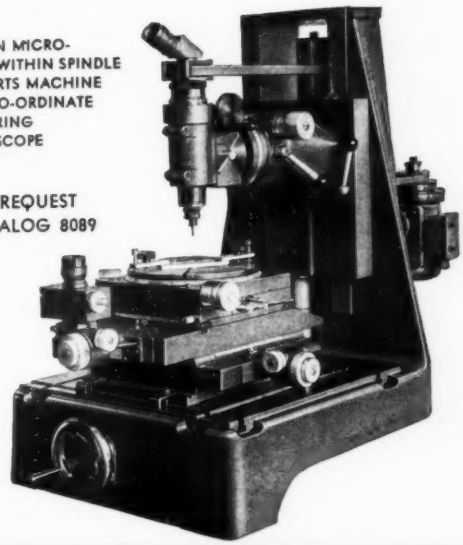

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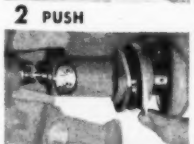
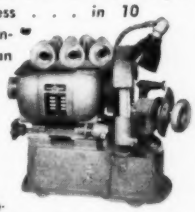


3 TWIST

4 GRIND

The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness . . . *in 10 seconds!* Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web-thinning equally simple! Pays for itself many times over!



Also manufacturers of the WORCESTER DRILL GRINDER for drills up to 2½".

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SAW & MACHINE WORKS

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Did you know that - - -

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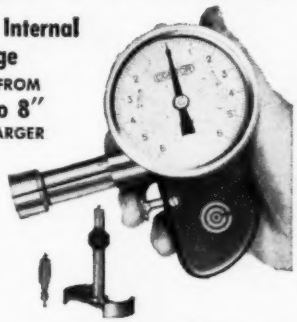
Precision Internal Gage

SIZES FROM 1/8" to 8" AND LARGER



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Unique Advantages

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- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable—no wires, hoses or stands.

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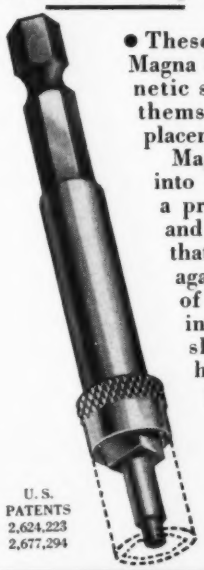
For Driving Hex Head Sheet Metal and Self-Tapping Screws

An Exclusive, Patented Magna Design



U. S. PATENTS 2,624,223 2,677,294

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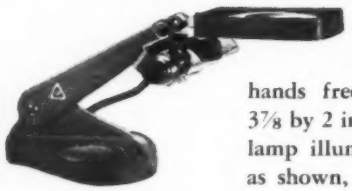

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Bench model has adjustable stand, weighted base, leaves hands free. Rectangular lens measures 3⅞ by 2 inches. Focus is 9 inches. Shaded lamp illuminates the work. Price $19.50 as shown, $13.50 less the lamp assembly.

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Bulletin 1-67

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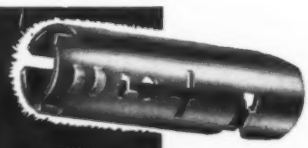

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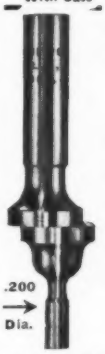

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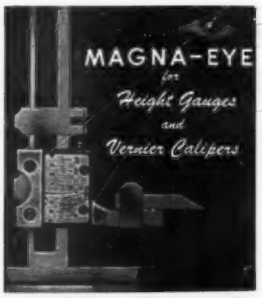

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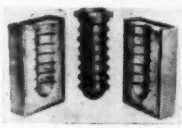

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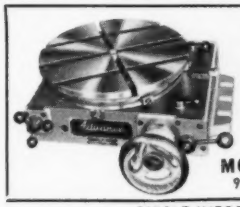

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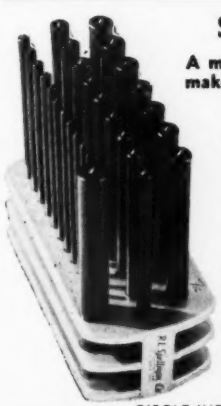

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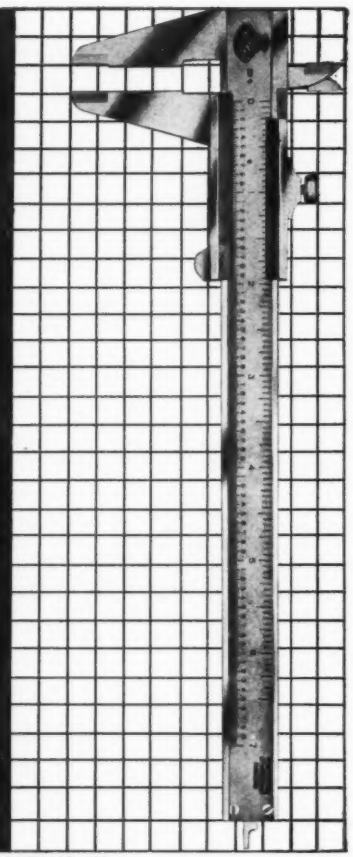

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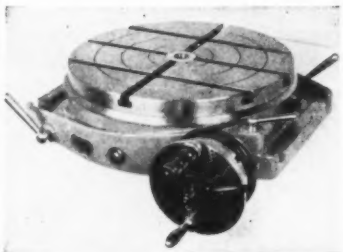

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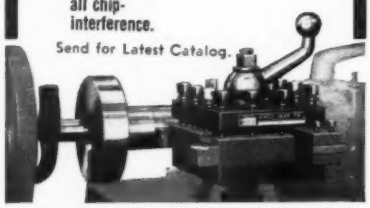

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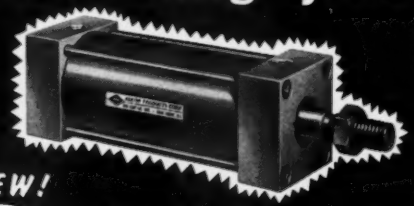

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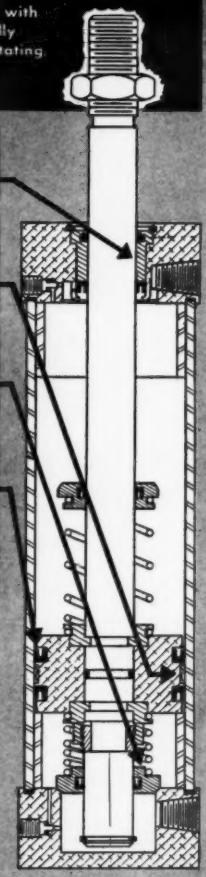

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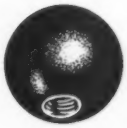
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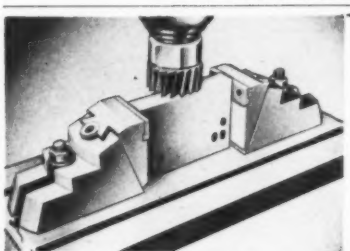

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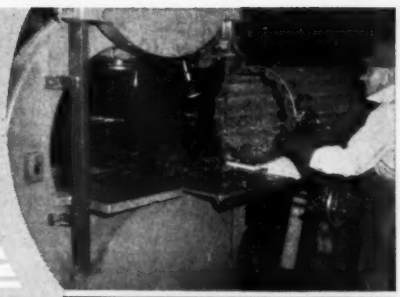

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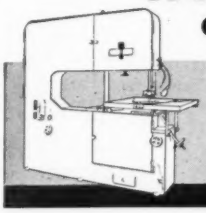

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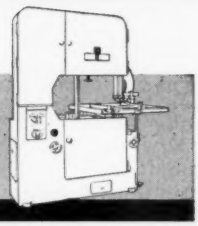

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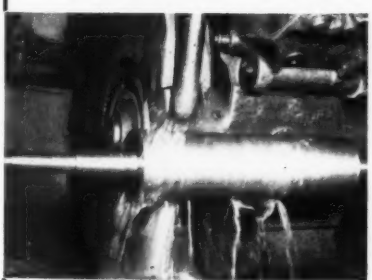

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No Clogging

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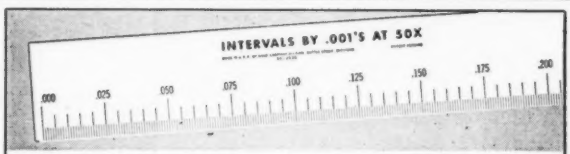

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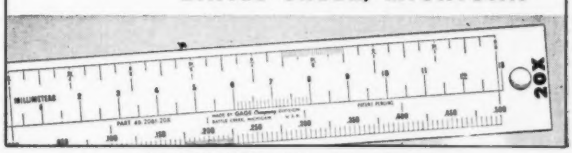

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